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By E. L. BOUSFIELD

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HAUSTORIIDAE OF NEW ENGLAND (CRUSTACEA: AMPHIPODA)

By E. L. Bousfield[1]

Introduction

The family Haustoriidae embraces a heterogeneous group of gammaridean amphipods that are variously adapted for burrowing and filtering minute food particles from the substratum.

Partly because of their restricted ecology, fossorial habits, and small size, relatively few of these remarkable crustaceans were described or recorded from American-Atlantic and New England waters by early carcinologists. Holmes (1904) recorded *Pontoporeia femorata* Krøyer from "somewhere on the New England coast" and amplified the earlier records of Smith (1874, 1880) for "*Haustorius arenarius*" (Slabber) in the Cape Cod region. Paulmier (1905) and Kunkel (1918) recorded and figured this European species from coastal waters of New York City and the state of Connecticut, respectively. The writer (1962b) tentatively synonymized Paulmier's species with *Haustorius canadensis*, newly described from the Gulf of St. Lawrence, and simultaneously (1962b) diagnosed a further species, *Haustorius spinosus*, from shore localities in the Bay of Fundy.

A number of other haustoriid species, recorded or described from the Bay of Fundy and elsewhere in eastern Canada, were believed to

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range southward at least into coastal waters of northern New England and probably throughout the Gulf of Maine. These included two species of the genus *Amphiporeia*, *A. lawrenciana* Shoemaker (1929, 1930) and *A. virginiana* Shoemaker (1933), as well as *Bathyporeia quoddyensis* Shoemaker (1941) and *Priscillina armata* (Boeck) 1861. *Pontoporeia affinis* Lindstrom 1875, commonly encountered in arctic and subarctic intertidal and estuarine localities of eastern Canada (Dunbar, 1954; Bousfield, (1956a) and also known from fresh-water Lake Chamberlain in northern Maine (Bousfield, 1958a), less probably occurs in New England coastal marine waters. Doubtfully occurring in the region is the puzzling *Lepidactylus dytiscus* Say 1818, originally described from the coast of Georgia, and *Haustorius americanus* Pearse 1908, collected at Cameron, La., but not recorded elsewhere. North American species of the genus *Eohaustorius* Barnard 1957 apparently are restricted to the North Pacific region, and species of the cold-temperate genus *Urothöe* have not been recorded from the western Atlantic, although well known from the European and African coasts. Thus, the previously known or probable haustoriid fauna of New England consisted of less than a dozen species in five or six genera.

As a sequel to the studies on *Haustorius* in eastern Canada (Bousfield, 1962b), the writer examined considerable material of this genus from the New England coast, particularly from localities in the Cape Cod region. Much of the material was collected during the past five or six years, particularly during the period June–September 1963; the remainder consisted of the original study material of S. I. Smith, Samuel Holmes, C. R. Shoemaker, and their associates, now stored at the Yale Peabody Museum, the Harvard Museum of Comparative Zoology, and the United States National Museum in Washington.

A number of distinct types have been discovered, the diversity of which is believed sufficient for new generic as well as new specific recognition. The affinities of these new taxa provide the basis for subfamily differentiation within the heterogeneous complex of the Haustoriidae. This study, therefore, is an attempt to combine the previous information with the present findings, to redefine the family Haustoriidae and the type genus *Haustorius*, and to propose a new phylogenetic concept within the systematic unit.

Herewith, newly described, are the subfamilies Pontoporeiinae and Haustoriinae, the genera *Protohaustorius*, *Parahaustorius*, *Neohaustorius*, *Pseudohaustorius*, and *Acanthohaustorius*, and the species *Protohaustorius deichmannae* and *P. wigleyi*, *Parahaustorius longimerus*, *P. holmesi*, and *P. attenuatus*, *Neohaustorius biarticulatus* and *N. schmitzi*, *Pseudohaustorius caroliniensis* and *P. borealis*, and *Acanthohaustorius millsi*, *A. intermedius* and *A. shoemakeri*. *Haustorius*

spinosus Bousfield is placed in the genus *Acanthohaustorius* and the morphological variation and geographical range of *Haustorius canadensis* is more fully delimited. The known and probable New England haustoriid fauna now includes 20 species in 10 genera and 2 subfamilies.

The following abbreviations are used throughout the figure legends:

A	antenna	PED	peduncle
EP	epimeron	PL	pleopod
GN	gnathopod	PUD	pleosome and urosome, dorsal aspect
HD	head and antennae, without setae	PUL	pleosome and urosome, lateral aspect
LFT	left	RT	right
LL	lower lip	T	telson
MD	mandible	U	uropod
MX	maxilla	UL	upper lip
MXPD	maxilliped		
P	peraeopod		

The writer is grateful to interested persons who collected material and granted permission to examine collections used in this study. Particularly helpful have been Dr. Elisabeth Deichmann, Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; Dr. Willard Hartman, Yale Peabody Museum, New Haven, Conn.; Dr. T. E. Bowman, U.S. National Museum, Washington, D.C.; Dr. Roland L. Wigley, U.S. Fish and Wildlife Service, Woods Hole, Mass.; Dr. W. D. Burbanck, Emory University, Atlanta, Georgia; and Dr. Eugene H. Schmitz, formerly of the Duke Marine Laboratory, North Carolina. Special thanks are due Dr. Eric L. Mills, now in the Department of Zoology, Queens University, Kingston, Ontario, who personally collected five of the species newly described and provided valuable notes on the behavior and ecology of the intertidal and shallow-water species of the Cape Cod region.

The following abbreviations are used throughout the text:

NMC National Museum of Canada, Ottawa
MBL Marine Biological Laboratory, Woods Hole, Mass.
USFW United States Fish and Wildlife Service, Washington, D.C.
USFC United States Fish Commission
USNM United States National Museum, Washington, D.C.
YPM Yale Peabody Museum, New Haven, Conn.

Evolution and Phylogeny

The family Haustoriidae is a relatively ancient and morphologically primitive group of gammaridean Amphipoda. The para-ancestral haustoriids (cf. *Pontoporeia*) are only slightly more specialized for fossorial existence than are some members of the ultraprimitive family Gammaridae (e.g., *Gammarus lawrencianus*), from which stock they

may have arisen. Careful comparison of antennae, mouthparts, gnathopods, uropods, and telson indicates few basic differences between *Pontoporeia* and *Gammarus*, a similarity that is reinforced by the pronounced sexual dimorphism and similar mating behavior in the two genera. Dennell (1932) concluded that, aside from special secondary modifications of maxillae and maxillipeds, the mouthparts of *Haustorius arenarius* strongly resembled those of *Gammarus locusta*. Only the relatively elongate peraeopod 4, the strongly expanded basos of peraeopod 5, and acute anterolateral headlobes of the Haustoriidae consistently separate members of this family from typical Gammaridae. Ecologically, the two families overlap considerably, with both represented mainly in shallows of marine, brackish, and fresh waters, and with relatively few species in the deep benthos.

The Gammaridae may now be considered to encompass the prototype or the morphologically most primitive species of existing Amphipoda. In the fresh-water *Gammarus lacustris*, for example, the mouthparts and limbs are completely and regularly segmented, fully developed and fully setose, and are the least differentiated or specialized of all known gammarids. The Gammaridae is essentially a fresh-water family, with two-thirds of the genera listed in Barnard (1958) being nonmarine. The family is mainly cold-temperate in the northern hemisphere. By contrast, aquatic members of the highly evolved and land-adapted Talitroidea largely occupy the relatively warm fresh waters of the southern hemisphere.

The morphologically most specialized and highly evolved Gammaridae (e.g., *Melita*, *Ceradocus*) are fully marine, warm-temperate or deep-water pelagic forms. Similarly the Haustoriidae are essentially shallow-water, cold-temperate animals, and are represented in fresh-water and coldest (high latitude) marine regions by the primitive genus *Pontoporeia*, at intermediate temperatures and latitudes by the more advanced *Amphiporeia*, *Bathyporeia*, and *Priscillina*, and along the warm, low-latitude marine shores by the highly evolved Haustoriinae.

The construction of a hypothetical family tree within the Haustoriidae presents some difficulty because of the likelihood of parallel evolution and morphological convergence in groups of different origin. This phenomenon is illustrated on a broader basis by the fossorial form of *Priscillina*, a form that has evolved independently among such diverse gammaridean families as the Gammaridae (e.g., *Pontogammarus*), the Lysianassidae (e.g., *Tmetonyx nobilis*), the Phoxocephalidae (e.g., *Paraphoxus*), and the superfamily Talitroidea (e.g., *Dogielinotus*). Reliable indices of their true familial relationships are provided by the form of certain mouthparts, especially the mandible and lower lip, by the shape and armature of the female brood plates,

by the form of the first gnathopods, especially in the male, and by the form of the third uropods and telson. The prototype haustoriid, probably not unlike *Pontoporeia affinis*, became specialized along two main lines, still traceable within the Pontoporeiinae. One line, which includes *Amphiporeia* and *Bathyporeia*, retained the slender body and limbs and sexual dimorphism that characterize species of a non-specialized feeding type and loose infaunal association. The other line, leading through *Pontoporeia femorata* to *Priscillina*, evolved the broadly arched body, specialized limbs, powerful pleopods, and similarity of the sexes coincident with a fossorial mode of life. From this second line, and probably in warm temperate regions, evolved the modern haustoriinid with its unique water-pumping and filter-feeding mechanism. Intermediate stages linking the pontoporeiid prototype with the most primitive haustoriinid (e.g., *Protohaustorius*) apparently did not persist to the present time. Within the Haustoriinae, the form of the maxillae in *Pseudohaustorius* and even in *Protohaustorius* might be interpreted as a secondary loss of the filter-feeding mechanism and a return to the typical gammaridean method of feeding on large food particles.

Field behavior.—Present knowledge of the behavior and ecology of the littoral haustoriids of New England is scanty. In the British Isles, the feeding, swimming, and burrowing habits have been described in *Haustorius arenarius* by Dennell (1932), in various species of *Bathyporeia* by Watkin (1939), and in *Urothoe marina* by Watkin (1940). *Haustorius* swims on its back and burrows by a modification of the swimming movements. Burrowing is dependent on the expulsive action of the swimming current and cannot, therefore, be effected in damp or dry sand. The filter feeding mechanism involves the collection of food particles via a forward-directed current in the enlarged plates of maxilla II, its removal by the maxilliped setae, and subsequent transfer to the maxilla I, mandibles, and mouth opening. This mechanism is a secondary development of the raptorial feeding mechanisms in normal gammaridean Amphipoda. Say's excellent description (1818) of *Lepidactylus dytiscus* from the coast of Georgia included details of swimming and burrowing behavior that clearly mark the species as a member of the Haustoriinae.

Zoogeographical and ecological relationships.—The Haustoriidae exhibit considerable ecological diversity in cool-temperate regions of the northern hemisphere. Within the North Atlantic region the Pontoporeiinae are best represented in the subarctic and cold-temperate (boreal) regions whereas the Haustoriinae have radiated mainly in the cool-to-warm-temperate (Virginian and Carolinian) zones. The Cape Cod region of the western Atlantic occupies a position of overlap between the cold-temperate faunas to the north

and the warm-temperate faunas to the south and is thus relatively rich in species of both subfamilies. Some of the species (e.g., in *Neohaustorius*, *Parahaustorius*, and *Acanthohaustorius*) appear to be endemic to the Cape Cod region although further careful collecting in selected habitats undoubtedly will increase the geographical range, particularly southward, in these instances. Such endemicity, whether real or apparent, is known in other invertebrate groups (e.g., cumaceans, mysids). The wide range of inshore water temperatures in the Cape Cod region, both geographically and bathymetrically, coupled with the absence of extreme or prolonged winter lows and excessive summer highs, enhances the suitability of the habitat and thus contributes significantly to the richness and diversity of its haustoriid fauna. In this respect the region compares favorably with the southern British Isles in the eastern Atlantic and with southern California in the eastern Pacific.

New England haustoriids are essentially intertidal and shallow-water crustaceans. On the outer, surf-exposed sand beaches, especially where sand remains damp at low water through seepage or freshwater outflows, are found the large *Haustorius canadensis*, the smaller *Amphiporeia virginiana*, and minute *Bathyporeia quoddyensis*. Along semiprotected shores, *H. canadensis* occurs at midwater levels, whereas the somewhat smaller *Parahaustorius longimerus* and *Acanthohaustorius millsi* are dominant near low-water level. Here also, particularly near the mouths of sandy estuaries, *Protohaustorius deichmannae* is often abundant. *Neohaustorius biarticulatus* is restricted to sandy banks of salt marsh creeks. Subtidally and offshore, especially over the southern Georges Bank region and Long Island Sound, occur the larger and more powerful species, such as *Parahaustorius holmesi* and *P. attenuatus*, others of intermediate size, such as *Protohaustorius wigleyi*, *Pseudohaustorius borealis*, and *Acanthohaustorius shoemakeri*. *Pseudohaustorius caroliniensis* is an estuarine form of muddy sand and seepage beds from Buzzards Bay southward.

From Casco Bay northward along the outer coasts of Maine and Nova Scotia, *Haustorius canadensis*, *Acanthohaustorius millsi*, and *Protohaustorius deichmannae* quickly disappear, but the former reappears along the dune beaches in the southwestern Gulf of St. Lawrence and Cape Breton Island (Bousfield, 1964b). Similar habitats of the colder intervening region are populated largely by the isopod *Chiridothea caeca*, whereas the low-water and subtidal levels are dominated by *Amphiporeia lawrenciana*, the minute *Bathyporeia quoddyensis*, and the large lysianassid *Tmetonyx nobilis*. *Acanthohaustorius spinosus* and *Bathyporeia quoddyensis*, normally subtidal, appear regularly at low-water level of the few sand beaches

of the cold-water Bay of Fundy (Bousfield, 1962a). On smooth, gently sloping, surf-exposed sand beaches, *Amphiporeia virginiana* continues northward along the outer coast of Nova Scotia almost to Cape Breton Island. In corresponding estuaries, *Pontoporeia femorata* frequents the sandy mud channel banks, and *Gammarus lawrencianus*, the sandy eel-grass shallows. North of the Scotian shelf, *Pontoporeia femorata* and *Priscillina armata* dominate suitable bottom sediments, and the subarctic estuaries are populated by *Pontoporeia affinis*, along with *Pseudolibrotus littoralis*, *Oediceros* spp., and other burrowing amphipods.

Southward from New England, the surf-swept beaches are occupied by *Protohaustorius longimerus*, by a long-rostrate species of *Haustorius*, otherwise very similar to *H. canadensis* and *H. arenarius* (Bousfield, in press), and by *Neohaustorius schmitzi*. Although several of these species persist southward to North Carolina and Georgia, an additional complex of haustoriids, particularly in the *Pseudohaustorius* and "*Lepidactylus*" groups, dominate the intertidal and estuarine faunas of the southeastern and Florida-Atlantic coasts.

As previously noted, the relationship between geographical distribution and phylogeny within the Haustoriidae is simulated closely in other families of amphipods. If of broader application, this relationship may prove useful in the interpretation of the origin and probable lines of diversification within the entire gammaridean suborder of the Amphipoda.

Family Haustoriidae

(emendation of Stebbing, 1906)

Gammaridean amphipods with body and appendages adapted for burrowing and mouthparts more or less modified for filtering minute food particles from the interstitial water of bottom sediments. Head and body segments usually broad and deep, plates and appendages of peraeon and pleon tending to form a ventral cylindrical tunnel through which a strong posteriorly directed water current is maintained by the action of the powerful pleopods. Rostrum variously developed, not hoodlike. Eyes small, weakly pigmented or lacking. Antennae short, subequal, usually richly plumose or setose; antenna 1 with short accessory flagellum and calceolate primary flagellum. Mouthparts tending to enlargement of primary plates and development of accessory lobes; mandible with large palp and strong molar, incisor and lacinia usually weak; upper lip squarish or broad-rounded; lower lip: inner lobes distinct, elongate. Coxal plates large, deep, margins setose. Gnathopods usually unlike, weakly subchelate, chelate, or simple. Peraeopods 1 and 2 subequal and usually alike,

dactyls small or lacking. Peraeopods 3–5, basal segments broadly expanded, segments 4 and 5 frequently broad, dactyls small or lacking. Peraeopod 4 longest, 5 slightly shorter, 3 shortest. Peraeon segments 2–6 inclusive with simple, saclike coxal gills. Brood plates variously reduced, small or vestigial on peraeon 3. Pleopods strong, peduncle short, stout. Urosome normal or variously reduced. Uropods normally biramous, 3rd slender, with 2-segmented outer ramus. Telson broad, flattened, entire, deeply cleft or bilobed. Sexes dimorphic, tending to likeness in fossorial species.

TYPE GENUS.—*Haustorius* Müller 1775.

REMARKS.—The family Haustoriidae resembles the Phoxocephalidae in gross morphology and fossorial habits. The genus *Urothoe*, usually placed in the Haustoriidae, has several characters common to the two families. Although lacking a hooded rostrum, *Urothoe* is closer to *Paraphoxus* and typical Phoxocephalidae in the form of its mouthparts, gnathopods, and peraeopods. The development of raptorial gnathopods, reduced maxillary plates, and weak mandibular molar suggests a carnivorous feeding type in at least some of the Phoxocephalidae, whereas the Haustoriidae are essentially filter feeders and minute particulate scavengers.

Pontoporeiinae, new subfamily

Head and body segments of normal width, seldom tumid or produced laterally. Rostrum weak or lacking. Eyes usually present, well pigmented. Pleon not abruptly narrowing beyond peraeon. Urosome normal, frequently dorsally toothed or pilose; posteroventral lappet lacking. Antenna 1 variously geniculate, peduncular segments 2 and 3 short. Antenna 2: peduncular segments 4 and 5 not lobate or excessively plumose behind.

Mouthparts about normal. Lower lip: inner lobes small, outer lobes with pronounced lateral wings. Mandibular incisor and lacinia moderately developed. Maxilliped palp slender, 4-segmented. Gnathopod 1 subchelate; gnathopod 2 subchelate or simple, usually unlike gnathopod 1. Peraeopods 1 and 2 similar, dactyls present. Peraeopods 3–5: segments 4–5 not expanded, dactyls small or vestigial. Pleopods normal, rami subequal. Uropods 1 and 2 normal, similar, equally biramous, uropod 2 smaller. Uropod 3 large, rami flat, marginally setose, unequal. Telson cleft or bilobed. Sexes dimorphic, female usually the larger. Brood plates large, moderately developed on peraeon 3. In male, flagellum of antenna 2 elongate, bearing platelike calceoli; uropod 3 elongate, natatory.

TYPE GENUS.—*Pontoporeia* Krøyer 1842.

COMPONENT GENERA.—*Pontoporeia* Krøyer 1842, *Amphiporeia* Shoemaker 1929, *Bathyporeia* Lindstrom 1855, *Priscillina* Stebbing 1888, *Haustoriopsis* Schellenberg 1938, *Urothöe* Dana 1852(?).

REMARKS.—A separate subfamily may be required for *Urothöe*, its deep-sea generic complex, and *Carangolia* Barnard 1961. These genera show many features in common with the Phoxocephalidae including the strongly subchelate and similar gnathopods, large accessory flagellum, equally biramous third uropods, dactylate peraeopods, and slender female brood plates. The mouthparts, with weak mandibular palp, small maxillae, slender maxilliped palp, and broad lower lip, suggest a carnivorous or large-particulate feeding function, rather than the filter-feeding mechanism of typical Haustoriidae.

Haustoriinae, new subfamily

Head and body segments broadly arched, tumid or cylindrical; rostrum usually strong, antennal sinus deep; eyes small, weakly pigmented, or lacking. Peraeon segments produced laterally in short lobes to which limbs are attached; pleon abruptly narrowing beyond peraeon, posterior margin often overhanging urosome. Urosome segments variously reduced, segments short, narrow, dorsally smooth; urosome 1 with posteroventral lappet. Antennal peduncular segments short, broad, margins thickly setose or plumose; antenna 1: flagellum short, usually with elongage calceolae; antennae 2: peduncular segments 4 (occasionally 5), lobate behind, flagellum short, noncalceolate in either sex.

Mouthparts variously modified. Lower lip: inner lobes large, elongate; outer lips laterally rounded. Mandibular palp and molar strong, incisor and lacinia weak, occasionally lacking. Maxilla 1 typically with lateral coxal baler lobe. Maxilla 2: outer plate often large, broad, strongly plumose. Maxilliped palp broad, 3-segmented. Gnathopod 1 simple. Gnathopod 2 minutely chelate, otherwise similar to gnathopod 1. Coxal plates 1–4 deep, posterior angle acute. Peraeopods without dactyls. Peraeopods 1 and 2 powerfully fossorial, usually similar. Peraeopods 3–5: segments 4 and 5 broadly expanded, margins richly spinose and/or plumose. Pleopods strong, peduncles short and broad, outer ramus longer. Uropod 1 strong, spinose, usually unequally biramous, occasionally uniramous. Uropod 2 much smaller and unlike uropod 1, thickly setose, occasionally uniramous. Uropod 3 short, rami subequal, setose at apices. Telson entire, variously cleft, or bilobed. Sexes similar, male smaller. Female brood plates small or vestigial on peraeon 3.

TYPE GENUS.—*Haustorius* Müller 1775.

COMPONENT GENERA.—*Haustorius* Müller 1775; *Eohaustorius* Barnard 1957; *Protohaustorius*, new genus; *Parahaustorius*, new genus; *Neohaustorius*, new genus; *Pseudohaustorius*, new genus; *Acanthohaustorius*, new genus.

REMARKS.—The status of *Lepidactylus* Say 1818 is being clarified elsewhere (Bousfield, in prep.). Despite the wealth of descriptive detail, Say's species, *L. dytiscus*, cannot be identified with certainty with any of the species or even genera herewith proposed as new. Unfortunately Say's type is not available. Recent studies on material of *Haustorius* (or near relative) endemic to the Atlantic coast of Georgia and Florida indicate that a common intertidal estuarine species, presently being redescribed, is probably Say's species.

Antiboreal genera *Cardenio* Stebbing 1888, *Urohaustorius* Sheard 1937, *Urothoides* Stebbing 1891, *Platyischnopus* Stebbing 1888, and *Phoxocephalopsis* Schellenberg 1931, show characteristics of the present two subfamilies but are distinctive and divergent rather than transitional. Further study of their subfamily affinities, based on fresh material, is suggested.

Key to Genera and Species of Haustoriidae in New England Waters

1. Body usually slender, peraeon segments not laterally lobate; rostrum weak or lacking, eyes usually well pigmented; pleosome and urosome normal; gnathopod 1 subchelate; gnathopod 2 simple or subchelate; peraeopods with small dactyls; peraeopods 3–5, segments 4 and 5 not broadened; uropod 2 spinose, similar to but smaller than uropod 1; maxilliped palp slender, 4-segmented; lower lip, outer lobes with lateral wings. PONTOPOREIINAE. 2

   Body usually broad, peraeon segments laterally lobate; rostrum distinct, eyes weakly pigmented or lacking; pleon usually abruptly narrowing beyond peraeon, urosome variously reduced; gnathopod 1 simple, gnathopod 2 minutely chelate; peraeopods without dactyls; peraeopods 3–5, segments 4 and 5 posteriorly broadened; uropod 2 setose, much smaller than and unlike uropod 1; maxilliped palp 3-segmented; lower lip, outer lobes laterally rounded . . . . . HAUSTORIINAE. 7

2. Antennae 1 not geniculate, peduncular segment 1 slightly longer than 2 and 3 combined; peraeopod 3 of normal attitude; uropod 3, outer ramus less than twice the peduncle, terminal segment vestigial 3

   Antenna 1 geniculate between peduncular segments 1 and 2, segment 1 much longer than 2 and 3 combined; peraeopod 3 doubly geniculate; uropod 3, outer ramus more than twice the peduncle, terminal segment conspicuous 5

3. Body slender, pleosome smooth or hirsute dorsally; eyes well pigmented; accessory flagellum 2-segmented; coxal plates 1–4 normal; gnathopods 1 and 2 subchelate, dissimilar . . . . . **Pontoporeia.** 4

   Body broad, pleosome segments 2 and 3 (occ. 1) mid-dorsally toothed; eyes lacking; accessory flagellum 3–4 segmented; gnathopods 1 and 2 subchelate similar . . . . . **Priscillina**

Peraeopods 3 and 4, segment 2 with posteroproximal spinous process; only one North Atlantic species known . . . . **Priscillina armata** (Boeck)

4. Urosome segment 1 with mid-dorsal bifid prominence; anterolateral head lobe sharply acute; eyes large, reniform . **Pontoporeia femorata** Krøyer

Urosome segment 1 dorsally smooth, finely pilose; anterior head lobe subacute; eyes small, subovate . . . . . **Pontoporeia affinis** Lindstrom

5. Gnathopod 2 weakly subchelate; maxilliped palp, segment 3 short, broad; uropod 3, inner ramus slender, longer than peduncle; telson incompletely cleft . . . . . **Amphiporeia.** 6

Gnathopod 2 subfusiform, heavily setose; maxilliped palp, segment 3 slender, strongly arched; uropod 3, inner ramus lobate, shorter than peduncle; telson typically cleft to base . . . . . **Bathyporeia**

Urosome segment 1 with dorsal and lateral spines.

Bathyporeia quoddyensis Shoemaker (p. 171)

6. Antenna 1 weakly geniculate; abdominal side plate 3 subquadrate, posterior margin gently convex; uropod 3 elongate, inner ramus and terminal segment of outer ramus subequal . . . **Amphiporeia virginiana** Shoemaker

Antenna 1 sharply geniculate; abdominal side plate 3 subacute, posterior margin shallow-concave; uropod 3 medium-long, inner ramus much longer than terminal segment of outer ramus.

Amphiporeia lawrenciana Shoemaker

7. Peraeopod 2 distinctly smaller than and unlike peraeopod 1; coxal plates 1 and 2 much smaller than 3 and 4; telson of two widely separated lobes. **Eohaustorius** (American Pacific)

Peraeopods 1 and 2 subequal, similar; coxal plates 1 and 2 appreciably deep and broad; telson entire or variously cleft, lobes approximate . . . 8

8. Posterodorsal border of pleon segment 3 free or slightly decurved, not reflexed; urosome and uropod 1 strong, rami spinose; pleon side plate 3 rounded 9

Posterodorsal border of pleon segment 3 strongly reflexed forming a lobe overhanging urosome; urosome short; uropod 1 slender, inner ramus with spines and setae; pleon side plate 3 (except in *Haustorius*) with posterior spinous process 15

9. Body relatively slender, lateral lobes of peraeon weak; pleon gradually narrowing behind; head not broadened, rostrum weak; maxilliped palp 3rd segment not geniculate; maxilla 2, outer plate little larger than inner . . . . . **Protohaustorius,** new genus. 10

Body broadly arched, peraeon lobes pronounced; abdomen abruptly narrowing beyond peraeon 7; head very broad, rostrum distinct; maxilliped palp terminal segment geniculate; maxilla 2 with large, setose, outer plate . 11

10. Coxal plate of peraeopod 2 much broader than deep, elongate behind; peraeopod 5, posterior border of segment 4 narrower than anterior border, with two spine groups; uropod 1, posterior margin of peduncle distally spinose . . . . **Protohaustorius deichmannae,** new species (p. 173)

Coxal plate of peraeopod 2 little broader than deep; peraeopod 5, posterior margin of segment 4 wider than anterior, with 3–4 spines; uropod 1, posterior margin of peduncle spinose throughout.

Protohaustorius wigleyi, new species (p. 175)

11. Uropod 2 strong, biramous; telson broad, sharply or broadly cleft; antenna 2, peduncular segment 5 broad but not lobate behind; mandible with incisor. **Parahaustorius,** new genus. 12

Uropod 2 small, uniramous, spatulate; telson small, entire; antenna 2, peduncular segment 5 lobate behind; mandible without incisor.
Neohaustorius, new genus. 14

12. Peraeopod 5, coxal plate broadly acute or rounded behind, segment 6 about equal to segment 5; uropod 1, posterior margin of peduncle spinose throughout; telson narrowly V-cleft, lobes rounded 13

Peraeopod 5, posterior lobe of coxal plate sharply elongated, segment 6 markedly longer than segment 5; uropod 1, posterior margin of peduncle centrally unarmed; telson very broad, shallowly V-cleft.
Parahaustorius attenuatus, new species (p. 182)

13. Peraeopod 5, segment 4 subrectangular, posterior margin subtruncate, with two (or three) prominent spines; peraeopod 4, segment 6 not longer than segment 5; uropod 1, inter-ramal spines less than half inner ramus.
Parahaustorius holmesi, new species (p. 180)

Peraeopod 5, segment 4 narrowing behind, posterior margin oblique, with one spine; peraeopod 4, segment 6 longer than segment 5; uropod 1, inter-ramal spines more than half length of inner ramus.
Parahaustorius longimerus, new species (p. 178)

14. Antenna 2, flagellum abruptly narrowing beyond segment 1; uropod 1 uniramous; maxilla 2, outer plate semilunate.
Neohaustorius schmitzi, new species (p. 188)

Antennae 2, flagellum gradually narrowing; uropod 1 unequally biramous, inner shorter (occasionally lacking); maxilla 2, outer plate broad, apically rounded . . . . . **Neohaustorius biarticulatus,** new species (p. 186)

15. Head broadest posteriorly, lateral margins subparallel, rostrum short; uropod 1, rami distally expanding, inner ramus the longer; uropod 3, terminal segment of outer ramus small or vestigial; maxilla 2, outer plate little larger than inner, weakly plumose; telson shallow-cleft, slender-setose.
Pseudohaustorius, new genus. 16

Head broadest medially, lateral margins convex, rostrum strong; uropod 1, rami distally tapering, outer ramus usually the longer; uropod 3, terminal segment of outer ramus normal, distinct; maxilla 2, outer plate very large, plumose; telson sharply cleft, short-spinose 18

16. Peraeopod 5, coxal lobe not exceptionally elongate; hindlobes of segments 4 and 5 lacking a distinct posterior border; hindmargin of telson nearly straight . . . . . **Pseudohaustorius borealis,** new species (p. 193)

Peraeopod 5, posterior coxal lobe large and elongate; hindlobes of segments 4 and 5 with distinct posterior border, each with two spine groups; telson broadly V-cleft 17

17. Antenna 1, peduncular segment 3 longer than first three flagellar segments; peraeopod 3, segment 6 shorter than width of segment 5; uropod 3, outer ramus distinctly 2-segmented.
Pseudohaustorius caroliniensis, new species (p. 191)

Antenna 1, peduncular segment 3 shorter than first two flagellar segments; peraeopod 3, segment 6 longer than width of segment 5; uropod 3, outer ramus appearing 1-segmented.
Pseudohaustorius americanus (Pearse)

18. Pleon side plate 3 rounded behind; uropod 1, rami subequal; urosome 2, dorsal margin short, nearly occluded; rostrum and anterolateral angles acute . . . . . **Haustorius** Müller. 19

Pleon side plate 3 with posterior spinous process; uropod 1, inner ramus shorter, usually more slender than outer; urosome 2 dorsal margin about equal to that of urosome 3; rostrum and anterolateral angles broad-acute.

Acanthohaustorius, new genus. 20

19. Peraeopod 5, posterior margin of segment 4 armed with 3–4 groups of spines; uropod 1, concave posterior margin lined throughout with spines, outer ramus with posterior spines only; rostrum extending slightly anterior of lateral angles (European-Atlantic only).

Haustorius arenarius (Slabber)

Peraeopod 5, posterior margin of segment 4 with one group of spines only; uropod 1, posterior marginal spines concentrated proximally and distally, both rami with spines and long setae; rostrum variable in length, may reach half length of antennal peduncular segment 1.

Haustorius canadensis Bousfield (p. 197)

20. Telson cleft nearly to base, posteromedial margins broadly convex; peraeopod 4, distal margin of segment 5 subtruncate; uropod 1, inner ramus slender, setae singly inserted; mature animals small (4–12 mm.) 21

Telson sharply U-cleft, ½ to base, lobes subtruncate behind; peraeopod 4, distal margin of segment 5 oblique; uropod 1, inner ramus strong, posterior marginal setae in clusters; animals medium-large (10–14 mm.)

Acanthohaustorius spinosus (Bousfield) (p. 204)

21. Pleosome 3, posterodorsal margin produced as a large subconial process, side plate with short weak spinous process; peraeopod 5, coxal plate posteriorly quadrate, posterior lobe of segment 4 short, posterior and proximal margins continuous, with 1 spine.

Acanthohaustorius intermedius, new species (p. 202)

Pleosome 3, posterodorsal margin normally rounded behind, side plate with large spinous process; peraeopod 5, coxal plate posteriorly acute, hindlobe of segment 4 elongate, posterior margin distinct, with 2 spines . . . 22

22. Uropod 1, inner ramus very slender and short, about ½ length of outer ramus; peduncle strongly spinose posteriorly; gnathopod 1, segment 5 slightly inflated; telson broad, lobes broader than long.

Acanthohaustorius shoemakeri, new species (p. 204)

Uropod 1, inner ramus nearly equal in length to outer ramus, peduncle with few posterior marginal spines; gnathopod 1, segment 5 strongly inflated, powerful; telson lobes as broad as long.

Acanthohaustorius millsi, new species (p. 199)

Subfamily Pontoporeiinae

Genus *Bathyporeia* Lindstrom

Bathyporeia quoddyensis Shoemaker 1949

Material examined.—Woods Hole, Mass., near Nobska Pt., sandy beach below low water, Aug. 16, 1959, E. L. Mills.: 1 ♀, ov., 5.0 mm., 1 imm. (NMC 7080); east side Nobska Pt., fine sand at low water, July 28, 1962, E. L. Mills.: 1 ♂, 5.0 mm.; 1 ♀ ov., 4.0 mm. (NMC 7081).

Cape Cod region, Mass., Meganset, at breakwater, fine sand, low water, Sept. 2, 1963: 2 ♂♂, 5 ♀♀; Little Sippewisset Marsh, beach at mouth, low water, Sept. 8, 1963: 1 ♂, 21 ♀♀; Wild Harbor,

south side, fine sand, low water, Sept. 15, 1963: 40 ♀♀; North Falmouth, Herring Brook, fine sand at mouth, low water: 1 imm.; off Nashawena Island, Quick's Hole, sand, 45 ft. grab, Sept. 18, 1963: 2 imm. (MBL, author collections).

Northern New England, 1963: more than 700 specimens obtained at 8 suitable collecting stations from East Sandwich, Mass., north to Saco Bay and Hermit Island, Maine; additional 200 specimens collected at Gosses Cocques and Salmon River beaches near the mouth of St. Mary Bay, western Nova Scotia (NMC, author collections).

Remarks.—Material from Woods Hole differs somewhat from the type material of Shoemaker (1949) from East Quoddy, Maine, in having a more pronounced and sharply undercut posterior basal lobe in peraeopod 5. Also, the dorsal spines of urosome 1 are more numerous, especially in the male. The male (penultimate stage) surprisingly is little different from the female. Antennal flagella are somewhat longer, 5–6 segmented, calceolate in antenna 2. Basal peduncular segment of antenna 1 is without the protuberance on the under surface. Pleon side plate 3 is weakly mucronate behind, but the posterior margin is more broadly convex.

The large peduncular first segment of left and right antenna 1 are approximated closely and taper distally to form a pseudorostrum, shielding the distal portion of the antenna much as in the Phoxocephalidae.

Subfamily Haustoriinae

Protohaustorius, new genus

Head normal, broadening somewhat posteriorly; rostrum short, antennal sinus shallow. Body relatively slender, lateral lobes of peraeon very short. Pleosome narrowing gradually behind peraeon 7, hindmargin slightly decurved but not reflexed nor overhanging side plates, rounded behind urosome. Urosome strong, with well-developed posteroventral lappet on segment 1, urosome 2 short, narrow. Antenna 1 semigeniculate, peduncular segment 1 enlarged, closely approximating its mate (as in *Bathyporeia*), segments 2 and 3 slender; flagellum calceolate in both sexes, accessory flagellum 2-segmented. Antenna 2, peduncular segments 4 and 5 elongate, 4 weakly lobate behind.

Upper lip apically rounded. Lower lip: inner lobes simple, distally rounded. Mandible: incisor and lacinia unicuspate, accessory blades few, palp large, comb row short. Maxilla 1: palp short, plumose; accessory lobe vestigial. Maxilla 2: outer plate small. Maxilliped: plates short, palp segment 3 not geniculate.

Gnathopods 1 and 2 slender, coxal plates distally broadest. Gnathopod 2: segment 6 short, tumid, thickly setose. Peraeopods 1 and 2 slender fossorial, coxa of 2 very broad. Peraeopods 3–5: segments 4 and 5 little expanded, marginal spines elongate. Peraeopod 3 about ⅔ peraeopod 5. Brood plate vestigial on peraeon 3. Pleopods: rami 10–14 segmented, outer ramus slightly longer. Uropods biramous. Uropod 1 strong; rami long, spinose, inter-ramal spines large; uropod 2 small, peduncle short. Uropod 3 longer, rami slender. Telson subquadrate, apically notched, sparsely spinose.

Type species.—*Protohaustorius deichmannae*, new species.

Additional species.—*Protohaustorius wigleyi*, new species.

Protohaustorius deichmannae, new species

Figures 1*k*, 2*c*, 4*k*, 6, 7

Material examined.—Cape Cod, Mass., Barnstable Harbor, beside west channel, sandy mud, low water, May 13, 1962, E. L. Mills, E. Deichmann, E. L. Bousfield: 3 ♂♂, 2 ♀♀, ov. (NMC 7032); sandy bar opposite town wharf, May 13, 1962, E. L. Bousfield: 1 ♀, holotype, 1 ♂, allotype (NMC 7030); same locality: 9 ♀♀, 6 ov., 18 ♂♂, 1 imm. (NMC 7031); near Nobska Point, sandy beach below low water, Aug. 16, 1959, E. L. Mills: 1 imm. (NMC 7033). Woods Hole, Mass., east end of Nobska Beach, low water, Aug 26, 1961, E. L. Mills: 2 ♀♀, 1 ov. (NMC 7034); east side of Nobska Point, fine sand at low water, July 28, 1962, E. L. Mills: 5 ♀♀, ov., 1 ♂, 10 imm. (NMC 7035).

Cape Cod region, Nobska Beach, fine sand, low water, Sept. 1, 1963: many specimens; Nobscussett Beach, at breakwater, low water, Sept. 9, 1963: 50+ specimens (MBL, author collections). Northern New England, 1963: more than 1800 specimens obtained at 11 suitable stations from East Sandwich and Cape Cod Canal, north to Prout's Neck, Saco Bay, Maine (NMC, author collections).

Description.—Female, 4.0–6.0 mm. Head a little longer than wide, eyes slit shaped, weakly pigmented, remote from shallow antennal sinus. Antenna 1: peduncular segment 2 subcylindrical, short; flagellum 5-segmented. Antenna 2: peduncular segment 4 medially broadest; flagellum 4-segmented, 1st segment much broader.

Upper lip: apex smooth. Lower lip: inner lobes apically rounded. Mandible with 3 accessory blades; terminal segment of palp with 4 comb spines and about 10 slender apical spines. Maxilla 1: inner plate with 5 marginal setae. Maxilla 2: outer plate with 10 pectinate and 2 plumose inner marginal setae. Maxilliped palp: segment 3 short clavate.

Gnathopod 1: coxa with 2 plumes at posterior angle; segment 3 short, 6 slender, dactyl with stout apical nail. Gnathopod 2: segment 2 anterior margin sinuous, segment 5 elongate, a few slender comb spines ventrodistally; segment 6 short, tumid. Peraeopod 1: coxa with single large seta at posterior angle; segment 4 slightly expanded, anterior margin bare; segment 6 small, with about 12 slender marginal spines. Paraeopod 2: posterior lobe large, acute, lower margin long, gently convex; segment 4 stout, anterior margin bare; segment 6 subovate, with about 20 slender marginal spines. Peraeopod 3: coxal lobes deep, broad, subequal, margins bare; segment 2 very broad proximally, posterior margin smooth; segment 4 sharply expanding distally, wider than subquadrate segment 5; segment 6 slender, slightly longer than segment 5. Peraeopod 4: posterior coxal lobe shallow, upper margin gently angled; segment 2 broadest proximally, smooth behind; segment 4 subtriangular, broadest distally, 2 rows of facial setae; segment 5 narrowing distally to short, nearly straight dental margin; segment 6 cylindrical, distinctly shorter than 5. Peraeopod 5 coxal plate shallow, posterior lobe short, blunt, segment 2 broad elliptical, posterior margin bare, sharply incised proximally; segment 4; posterior lobe narrowing, hindmargin oblique, with 2 spine groups; segment 5 narrow, posterior margin with 1 spine group; segment 6 narrowly spatulate, about equal to segment 5, terminal spines slender. Anterior coxal gills slender, posterior, short, saclike. Anterior 3 brood plates slender, with 20–30 marginal setae, that of peraeon 3 orbicular, vestigial.

Pleosome side plate 3 rounded behind, anteroventral margin nearly straight; 3 groups of marginal setae and a few isolated lateral facial setae. Pleopods with short strong rami, outer 12–14 segmented, inner about 10-segmented. Uropod 1: peduncle strong, posterior margin with proximal minute serrations and distal row of spines; inter-ramal spines slender; rami long and subequal, outer with 7 posterior spines and distal circlet of about 16 spines; inner with 4 single marginal spines and 10 terminal spines. Uropod 2: outer ramus slightly shorter than inner, both setose apically, peduncle with simple setae only. Uropod 3: rami longer than stout peduncle; terminal segment of outer ramus short, apices with long setae. Telson short with shallow apical V-cleft, lobes each with 5–6 slender marginal spines.

Male, 3.5–4.0 mm.: Smaller but similar to female. Antenna 1: flagellum 4–5 segmented, elongate calceoli on 1–4. Antennae 2 lacking calceoli.

Remarks.—*P. deichmannae* occurs mainly subtidally in shallow, semiprotected inshore water and estuaries, whereas the larger *P.*

wigleyi is a deeper water offshore form, only occasionally found inshore, sometimes in company with *P. deichmannae*.

The species is named in honor of Dr. Elisabeth Deichmann, who assisted in the discovery of the species and who has contributed greatly to knowledge of marine bottom invertebrates.

***Protohaustorius wigleyi*, new species**

FIGURES 1*l*, 2*b*, 4*l*, 8, 9

MATERIAL EXAMINED.—*Albatross*-101, sta. 89, 41°29′, 67°28′, Digby bag, 27 fms., Aug. 24, 1957: 1 ♀, holotype, 1 ♂, allotype (NMC 7036); same locality: 3 ♀♀, ov., 6 ♂, 3 imm., paratypes (NMC 7037); same locality, Smith grab: 1 ♀, ov., 2 ♂♂, 4 imm. (NMC 7040). *Albatross*-70, coll. 5, 40°51′, 68°20′, Digby bag, 25 fms., Dec. 7, 1955: 7 ♀♀, 10 ♂♂, 9 imm. (NMC 7038). *Albatross*-70, coll. 15, 41°38′, 67°57′, Digby bag, 11 fms., Dec. 9, 1955: 12 specimens, including ov. ♀♀ (NMC 7039). *Albatross*-101, sta. 86, 41°14′, 67°28′, Smith grab, 24 fms., Aug. 24, 1957: 3 imm. (NMC 7041). *Albatross*-101, sta. 109, 42°02′, 66°58′, Smith grab, 35 fms., Aug. 25, 1957: 1 imm. (NMC 7042).

Albatross-69, coll. 1, 41°52′, 69°59′, Van Veen grab, Nov. 15, 1955: 65 specimens; same locality, Digby grab: 6 adult specimens; *Albatross*-69, coll. 5, 40°33′, 68°57′, Van Veen grab, Nov. 16, 1955: 19 specimens; *Albatross*-70, coll. 8, 41°07′, 67°17′ Digby bag, Dec. 8, 1955: 27 ♀♀; *Albatross*-70, coll. 46, 41°06′, 67°38′, *Albatross*-70, coll. 1, 40°50′, 69°39′, Digby bag, Dec. 6, 1955: 28 specimens (USFW, R. L. Wigley collection).

Albatross-100, sta. 108, 42°08′, 67°04′, Smith grab, Aug. 25, 1957: 1 ♂. Series of *Albatross*-101, Smith grab, Aug. 22–29, 1957, sta. 26, 40°33′, 69°06′: 6 subadults; sta. 38, 40°34′, 68°51′: 1 specimen; sta. 69, 41°02′, 67°56′: 8 ♀♀; sta. 70, 40°57′, 67°52′: 10 adults; sta. 72, 40°49′, 67°49′: 2 adults; sta. 85, 41°09′, 67°29′: 4 adults; sta. 184, 40°48′, 68°06′: 12 adults; sta. 192, 40°48′, 69°02′: 2 subadults; sta. 186, 40°48′, 68°19′, Smith grab, 31 fms., Aug. 28, 1957: 10 ♀♀, ov., 2 ♂♂ (NMC 7043).

Cape Cod region, Nobscussett breakwater, sand, low water, Sept. 9, 1963: 4 specimens; off Nashawena Island, Quick's Hole, SE. entrance, sand, 45 ft. grab, Sept. 18, 1963: 20 adults, 7 imm.; Vineyard Sound, Deep Hole, sand, 100+ ft., Sept. 18, 1963: 1 imm. (MBL, author collection); East Sandwich, Mass., sand, low-water level, Aug. 11, 1963: 33 specimens (NMC, author collection).

DESCRIPTION.—Female 5.5–7.5 mm. Head as long as broad, rostrum broad, obtuse; eyes small, slitlike, removed from margin of shallow antennal sinus. Antenna 1: peduncular segment 1 long and

deep; segment 2 long, distally broadest; segment 3 short, bearing calceolate 5-segmented flagellum terminally and 2-segmented accessory flagellum subterminally. Antenna 2: lobe of peduncular segment 4 diverging distally, segment 5 slender; flagellum of 4 segments, 1st not markedly wider.

Upper lip with slightly bi-indented apex. Lower lip: inner lobes distally broad. Mandibular lacinia and incisor unicuspate; 3 serrated accessory blades; palp segment 3 with 10 short proximal comb spines and 11 slender apical spines. Maxilla 1: inner plate small, 8 slender, simple marginal setae; accessory lobe vestigial. Maxilla 2: outer plate rounding distally, inner margin with about 12 stiff setae proximally and 4 plumes distally. Maxilliped: palp segment 2 broad lobate distally; segment 3 arched, widest distally.

Gnathopod 1: posterior angle of coxa with 5 plumose setae; segment 5 slender, about ⅔ segment 2; segment 6 strong, slightly shorter, dactyl short, nail terminal. Gnathopod 2: posterior angle of coxa with 7 plumose setae; segment 2 sinuous, elongate; segment 5 with 4–5 clusters of slender comb spines ventrodistally; segment 6 tumid, slightly arched.

Peraeopod 1 posterior coxal angle acute, concave posterior margin with 7 plumes; segment 4 slender, anterior margin bare; segment 5: posterior lobe with about 10 slender spines and 6 plumose setae; segment 6 with 15 slender spines. Peraeopod 2: coxal plate produced posteriorly to subacute lobe, lower margin slightly convex; segment 4 strong, stout; anterior margin bare; segment 5 shallow behind, circlet of 8 spines; segment 6 with 14 marginal spines.

Peraeopod 3: posterior coxal lobe large and deep; segment 2 narrowing distally; posterior margin bare; segment 4 not broader than segment 5; segment 6 linear, marginal spines elongate. Peraeopod 4: posterior coxal lobe large, sparsely spinose below; segment 2 posteriorly nearly bare; segment 4 expanded behind a margin convex, spines slender; segment 5 subrectangular, distal margin with pronounced U-shaped incision; segment 6 slender, nearly as long as segment 5. Peraeopod 5: coxal plate rounded behind, margin with a few stout spines; segment 2 extremely broad, posterior margin nearly smooth, not proximally incised; segment 4 subrectangular, posterior margin broad, nearly truncate, with 3–4 stout spines; segment 5 narrow, posterior margin with 1 spine group; segment 6 broadest proximally, length about equal to segment 5; marginal spines long and numerous. Coxal gills slender, smallest posteriorly. Anterior 3 brood plates slender, 4th a minute lobe.

Pleosome side plate 3: entire margin smoothly rounded; lateral face with scattered clusters and singly inserted plumes. Pleopods: outer rami 14–17 segmented, inner 10-segmented. Uropod 1: peduncle

lined throughout posteriorly with stout spines and minute serrations, with a small proximal cluster of stiff setae; 3 stout inter-ramal spines; outer ramus with about 10 posterior spines and inner ramus with about 4. Uropod 2: rami slender, setose apically, about equal to stout peduncle. Uropod 3: rami slender with long apical spines; terminal segment of outer ramus nearly equal to peduncle. Telson with shallow, sharp V-cleft, lobes each with 5 unequal apical spines.

Male, 5.0–6.5 mm.: Similar but smaller than female. Antennae 2 noncalceolate.

Remarks.—*Protohaustorius wigleyi* occurs generally throughout the Georges Bank region, from the northeast slope and Cape Cod Bay southwards, from the shore line to more than 30 fathoms in depth.

Parahaustorius, new genus

Medium to large animals; head short, broadest posteriorly; rostrum strong, acute; antennal sinus deep. Body broad, lateral lobes of peraeon well developed. Pleosome abruptly narrowing behind peraeon 7, segment 2 broadest, hindmargin of 3 segment free, not decurved nor reflexed; side plates rounded behind. Urosome moderately strong, not overhung by pleosome; posteroventral lappet moderately developed; urosome 2 very short and much narrower than urosome 1.

Antenna 1: peduncular segments short and deep, anterior marginal setae simple; flagellum relatively long, accessory flagellum 2-segmented. Antenna 2: peduncular segment 4 broadly lobate, segment 5 stout; flagellum long, segments small.

Coxal plates 1–3 semilunate, distally narrowing and subacute; 4 not produced behind in subacute lobe. Gnathopod 1 powerful, dactyl simple. Gnathopod 2: segment 5 lacking ventrodistal pectinate spines; segment 6 not tumid. Peraeopod 1: segment 5 deeply lobate. Peraeopod 2: segment 5 short, narrow, segment 6 with marginal spines and plumes. Peraeopod 3 relatively small, barely half as long as peraeopod 4 and 5, which are exceptionally large and powerful. Peraeopods 3–5: segment 4 and 5 broad, surfaces richly spinose and setose. Peraeopod 4: segment 4 (merus) elongate, segment 6 slender, sublinear. Peraeopod 5: segment 5 with long posterior margin. Coxal gills large, slightly smaller posteriorly. Brood plates of peraeon 2–4 large, broad, that of peraeon 5 short, slender; marginal setae numerous, short, slender.

Pleopods strong, rami slender, outer 18–24 segmented, inner about 15-segmented. Pleon side plate 3 rounded posteriorly, with marginal cluster of plumes only. Uropods biramous. Uropod 1 very strong; peduncle stout, posterior margin spinose, inter-ramal spines very large; rami unequal, inner shorter, spinose behind. Uropod 2 and 3 sub-

equal, elongate, rami slender. Uropod 3: terminal segment of outer ramus long. Telson broad, apically incised, marginal spines slender, clustered laterally.

TYPE SPECIES.—*Protohaustorius longimerus*, new species.

ADDITIONAL SPECIES.—*P. holmesi*, new species, *P. attenuatus*, new species.

***Parahaustorius longimerus*, new species**

FIGURES 1*f*, 3*a*, 4*d*, 10, 11

MATERIAL EXAMINED.—Cape Cod, Mass., Barnstable Harbor, end of Beach Point, sand flat at low water, Aug. 31, 1959, E. L. Mills: 1 ♂, holotype (NMC 7071); Beach Point, coarse sand, low water, 12°C., May 19, 1962, E. L. Mills: 2 ♀♀, ov., 6 ♂♂, 3 imm., paratypes (NMC 7072); near Nobska Point, sandy beach below low water, Aug. 16, 1959, E. L. Mills: 13 ♂♂, 4 ♀♀, ov., 16 imm. (NMC 7073). Woods Hole, Mass., east end of Nobska Beach, fine sand at low water, Aug. 26, 1961, E. L. Mills: 30 specimens, imm. (NMC 7074); east side of Nobska Point, fine sand at low water, July 28, 1962, E. L. Mills; 1 ♀, ov., 2 imm. (NMC 7075). *Albatross*-101, coll. 15, 41°38′, 67°57′, Digby bag, 11 fms., Dec. 9, 1955: 1 ♀, ov. (NMC 7076). Smith's Island, Va., Ocean Beach, low-water zone, July 5, 1935, J. P. E. Morrison: 11 imm. specimens (USNM acc. 135197); same locality, 100 yds. north of southern tip of Ocean Beach, July 6, 1935, J. P. E. Morrison: 11 imm.; same locality, 200 yds. north of south tip of Ocean Beach, July 6, 1935, J. P. E. Morrison: 1 imm.

Nobska Beach, east end, fine sand, low water, Sept. 1, 1963: many specimens; Nobscusset Beach, at breakwater, sand at low water, Sept. 9, 1963: 100+ specimens; Naragansett Beach at mouth of Pattaquamsett Inlet, R.I., surf sand, low water, Sept. 23, 1963: 6 imm. (MBL, author collections).

Albatross-69, coll. 1, 40°52′, 69°59′, Nov. 15, 1955: 37 adults; *Albatross*-70, coll. 15, 41°38′, 67°57′, Digby bag, Dec. 9, 1955: 4 adults; *Albatross*-101, sta. 68, 41°06′, 68°00′, Smith grab, Aug. 24, 1957: 5 adults (USFW, R. L. Wigley collections).

DESCRIPTION.—Male, 9.5 mm. Head width about twice the length, rostrum broad, blunt conical; eyes small, ellipsoid, weakly pigmented, persisting in adult stage. Antenna 1: flagellum of 9 subequal segments, calceoli slender, 1½ times length of each segment; accessory segments slender, subequal. Antenna 2: anterior marginal setae of peduncular segment 4 short, surface sensory setae few and small; flagellum of 9–10 small segments, shortest proximally and bearing posterior plumose setae.

Upper lip very broad, apically rounding and smooth. Lower lip: inner lobes moderately long, apex broad, subtruncate. Mandibular incisor simple, lacinia small, unicuspate; accessory blades about 10. Palp long, slender, comb row of about 30 short spines, apex with 10 slender spines. Maxilla 1: inner lobe small, margin with about 15 forked setae; palp broadest at apex, with simple and plumose setae, accessory lobe large. Maxilla 2: outer lobe with short inner margin, proximally armed with about 16 pectinate spines and distally with about 25 plumose setae. Maxilliped: outer plate relatively narrow, palp narrow, distal lobe of segment 2 nearly attaining transverse margin of short geniculate segment 3.

Gnathopod 1: posterior coxal angle acute, margin with 6 plumose setae; segment 5 elongate, lower margin heavily setose; segment 6 slender, slightly arched; dactyl small, nail short, apical. Gnathopod 2: posterior coxal angle with 8–10 plumose setae; segment 2 long and slender; segment 5 nearly equal in length, narrow, posterior margin richly setose; segment 6 very slender and moderately arched, dactyl minute.

Peraeopod 1: coxa lunate, posteriorly setose; segment 2 powerful, plumose behind; segment 4 broadening distally, margins lightly setose; segment 6: broad posterior lobe armed with circlet of 12 short slender spines and 10–12 plumose setae; margin of spatulate segment 6 with about 18 slender spines. Peraeopod 2: coxa somewhat broader than deep, shallow sinus weakly setose; segment 2 short, stout; segment 4 powerful, margins convex; segment 6 short and deep, lobe circlet with 8 spines and 6 setae; segment 6 oval, nearly ringed with slender spines and a few plumes proximally. Peraeopod 3: coxal lobes shallow, subequal, segment 2 much broader than deep, sparsely setose behind; segment 4 broad, posterior margin truncate with about 5 spines and numerous long plumose setae; segment 5 narrower; segment 6 linear with 5 anterior spine clusters. Peraeopod 4: posterior coxal lobe deep, lightly setose; segment 2 slightly expanded, narrowing distally; segment 4 very long, margins subparallel, 4 rows of facial spine clusters; segment 5 longer than wide, anterior margin narrowing distally; segment 6 about equal to 5, slender, with 4 posterior spine clusters. Peraeopod 5: coxa with squarish posterior lobe; segment 2 very broad and orbicular, posterior margin bare; segment 5 subrectangular, posterior margin sharply truncate, with 2 heavy spines; segment 5 distally broadest, posterior margin very short, with 1 spine group; segment 6 nearly as long and quite broad, 5–6 spine clusters on each margin. Coxal gill of gnathopod 2 much the largest.

Pleosome side plate 3 shallowly convex, rounded behind, with 7 lateral clusters of setae. Pleopods: peduncle very broad and short, rami slender, inner 15-segmented, outer much longer and 24 segmented

Uropod 1: peduncle and rami subequal, slender, strongly spinose posteriorly; peduncle with proximal raised cluster of stout spines and long setae. Uropod 2: peduncle and rami subequal, with numerous slender simple setae. Uropod 3: rami slender, tapering distally; outer ramus longer, terminal segment much the shorter; peduncle short. Telson cleft narrowly, half way to base; lobes apically bare and smoothly rounding, about 5 lateral groups of short slender spines on each side.

Female, 7–10 mm.: Similar to and slightly larger than male. Telson similar but apparently with fewer lateral spines. Brood plate of gnathopod 2 about as long as segment 2, margins multisetose; that of peraeopod 3 short, slender, margins with 8–10 short setae.

Remarks.—The species is very common along surf-exposed or semiprotected sandy coastlines and offshore banks, ranging from the southwestern shore of Cape Cod Bay, southward to Georgia and northern Florida. The animal may burrow to a depth of 4 inches or more in the sand near low-water level.

***Parahaustorius holmesi*, new species**

Figures 1*h*, 3*b*, 4*f*, 12, 13

Haustorius arenarius.—Holmes, 1904, p. 476–477 (part), fig. p. 476 (not plate V, fig. 2).

Material examined.—New Jersey, off New England Creek, March 20, 1930, H. G. Richards: 1 ♂, holotype (USNM acc. 110360). Vineyard Sound, Mass. Quick's Hole, 109–110 ft. 1871, U.S. Fish Comm.: 1 ♀, ov., allotype (YPM no. 5626). Woods Hole, Mass., 1904–5 [no other data]: 1 ♀, ov. (USNM acc. 66504). *Albatross*-101, sta. 88, 41°24′, 67°28′, Smith grab, 18 fms., Aug. 24, 1947: 3 imm. (NMC 7066). *Albatross*-101, sta. 89, 41°29′, 67°28′, Smith grab, 27 fms., Aug. 24, 1957: 1 imm. (NMC 7067).

Albatross-101, sta. 90, 41°34′, 67°28′, Smith grab, Aug. 24, 1957: 1 ♀, ov.; *Delaware*-59–9, sta. 19, 41°43′, 68°05′, Smith grab, Aug. 6, 1959: 1 adult. (USFW, R. L. Wigley collections).

Description.—Male, 10.0 mm. Head broad and deep, rostrum strong. Eyes lacking in adults, small round weakly pigmented areas near anterolateral angles in immatures. Antenna 1: peduncular segment 1, proximal lateral setae weakly plumose or simple segment 2 subequal, broadening distally, anterior marginal setae long, weakly plumose; segment 3 short, broad; flagellum of 9 short segments, distally longest, accessory flagellum of 2 slender subequal segments, combined length nearly half the flagellum proper. Antenna 2: peduncular segment 4 slightly deeper than long, surface sensory setae in 2 rows of 5; segment 5 tunid, anterior setae long, weakly plumose;

flagellum of 11 segments, proximal 4 shortest, each with plumose seta behind.

Upper lip squarish, apical margin nearly straight, smooth. Lower lip: outer lobes heavily pilose distally, inner lobes rather slender, proximally acute. Mandible: incisor bicuspate on left, tricuspate on right side, bicuspate lacinia on right, lacking on left, accessory blades 9–10; palp moderate, segment 3 shorter than 2, comb row with 20 stiff spines; 10–11 slender apical spines. Maxilla 1: inner plate small, margin with 11 branching setae; palp strongly arched, setae non-plumose; accessory lobe small. Maxilla 2: outer plate short, broad, inner margin proximally with about 20 slender spines and distally with 10 plumose setae distally to apex. Maxilliped: inner plate with 10 slender inner marginal blades, outer plate nearly smoothly convex on both sides; palp: narrow apical lobe of segment 2 small; segment 3 sharply geniculate, stem thicker than median lobe.

Gnathopod 1: posterior coxal angle sharply rounded bearing 4 plumose setae; segment 2 arched behind, distally setose; segment 5 nearly as long, expanded and heavily setose behind; segment 6 strong, tumid, distally with long cleft-tipped setae; nail of dactyl strong, apical. Gnathopod 2: coxa similar to 1, angle with 6 plumose setae; segment 2 slender, slightly arched, segment 5 subcylindrical, simple setae behind; segment 6 similar to but slightly longer than in gnathopod 1, dactyl conspicuous.

Peraeopod 1: coxa semilunate, acute posterior angle with 5 plumose setae; segment 2 strong, plumose behind; segment 4 margins plumose; segment 5, deep posterior lobe with circlet of 13 slender spines and 6 long weakly plumose setae; segment 6 broad spatulate, 16 marginal spines. Peraeopod 2, coxa deep, smoothly convex below, posterior sinus long; segment 2 short, sublinear; segment 4 rather broad, margins plumose; segment 5: lobe circlet of 9–10 slender spines and 5 setae; segment 6 drop shaped, 11 with marginal spines and 5 setae. Peraeopod 3: coxal lobes subequal, hindlobe with oblique setose posterior margin; segment 2 very broad, with short setose hind-margin; segment 4 not wider than long, hindmargin with 4 spine groups; segment 5 squarish; segment 6 linear, slender, distinctly longer than 5. Peraeopod 4: coxal hindlobe steeply oblique, margin setose; segment 2: hindmargin setose proximally; segment 4 short and broad, with about 10 posterior spines and 4 facial rows of spine clusters; segment 5 almost square, distal margin truncate; segment 6 nearly as long, slender, with 4 posterior spine groups and terminal clusters. Peraeopod 5: coxal plate broadly acuminate behind, lower border with 4–5 stiff setae; segment 2 much broader than deep, anterior margin proximally with plumose setae, distally with slender spines, posterior margin nearly smooth; segment 4: posterior lobe

long and narrow, hindmargin short, oblique, with 1 spine cluster; segment 5 widest nadially, length of posterior margin more than half the anterior, 2 spine clusters present; segment 6 subequal, slender, wider proximally.

Pleon side plate 3, lower margin evenly and smoothly convex; 7 clusters of lateral plumose setae, 3 to 6 per cluster. Pleopods: peduncles squarish to broad rectangular; outer ramus 19-segmented, slightly longer than 15-segmented inner ramus. Uropod 1: peduncle stout, strongly arched, posterior margin lined with stout spines, proximal protruberance with a very strong spine and a row of 6 stiff setae; 2 stout inter-ramal spines; outer ramus heavier and longer than inner, both terminated in a cluster of long spines, and bordered behind with shorter spines. Uropod 2: rami slender, subequal, setose throughout, longer than peduncle, which is simply setose distally. Uropod 3: rami long and slender, fine spinose terminally, outer ramus distinctly longer than inner, terminal segment about equal to the peduncle. Telson finely cleft halfway to base, lobes smoothly rounding.

Female, 10–13 mm.: Similar to male but larger. Flagellum of antenna 1 without visible calceoli. Brood plate of gnathopod 2 short and broad, that of peraeopods 1 and 2 very large, of peraeopod 3 slender, short, with 10 marginal setae.

Remarks.—Holmes' description (1904, p. 476) and figure of 3rd uropod and telson unquestionably apply to this species. His photographic plate V (fig. 2) is that of the true *Haustorius arenarius* (Slabber) and probably is based on specimens from Devon, England, which he compared with American material. Despite the many differences (several of generic value) which he himself noted, he concluded that the European material was specifically identical with the American form. The size range (up to 18 mm.) considerably exceeds material of *H. holmesi* examined but equals the largest *H. canadensis* at hand. This large distinctive species is named in honor of the man who first described it and who contributed so greatly to North American carcinology at the turn of the century.

This species ranges offshore, usually in depths of 10–20 fathoms, from Georges Bank southwards.

***Parahaustorius attenuatus*, new species**

Figures 1*g*, 3*c*, 4*e*, 14, 15

Material examined.—New Jersey, sta. 156 [no other data]: 1 ♀, holotype, 1♀, paratype (USNM acc. 115760). New York, off Block Island, USFC Sta. 828, 1880: 1 ♀, ov. (USNM acc. 38612).

Vineyard Sound, Mass., Quick's Hole, 109–110 ft., USFC, 1871: 1 ♀ ov. (YPM 5626). *Albatross*-101, sta. 86, 41°14′, 67°28′, Smith grab, 24 fms., Aug. 24, 1957: 1 v. imm. (NMC 7070). *Albatross* sta. 88, 41°24′, 67°28′, Smith grab, 18 fms., Aug. 24, 1957: 1 ♂ (NMC 7068). *Albatross* sta. 89, 41°29′, 67°28′, Smith grab, 27 fms., Aug. 24, 1957: 4 imm. (NMC 7069).

Vineyard Sound, Mass., Quick's Hole, SE. entrance, 45 ft. grab, Sept. 18, 1963: 1 ♂, 2 juv.; Narragansett Beach, near Pattaquamsett Inlet, surf sand, low water, Sept. 23, 1963: 3 adult specimens (MBL, author collections).

Albatross-69, coll. 1, 41°52′, 69°59′, Nov. 15, 1955: 2 ♀♀, 1 imm.; *Albatross*-100, sta. 108, 42°08′, 67°04′, Smith grab, Aug. 25, 1957: 2 imm.; *Albatross*-101 series, sta. 24, 40°43′, 69°04′, Smith grab, Aug. 22–24, 1957: 1 v. imm.; sta. 68, 41°06′, 68°00′: 1 adult, 4 juv.; sta. 69, 41°02′, 67°56′: 1 v. imm.; sta. 60, 40°57′, 67°52′: 1 v. imm. (USFW, R.L. Wigley Collections).

Description.—Female, 10.5–14.0 mm. Head short, very broad, rostrum and lateral angles sharply acute, antennal sinus deep, eyes lacking in adult, small pigmented ellipsoids in juveniles. Pleosome broad, flat, not rounding dorsally. Urosome 1: ventral lappet short. Antenna 1: peduncular segment 1 very short, deep, lateral setae in semicircular arch, plumose distally, simple proximally; segment 2 shorter, expanded distally, anterior setae short, simple; segment 3 very short and broad; accessory flagellum of slender unequal segments combined length greater than first three of 9-segmented flagellum; calceoli apparently lacking. Antenna 2: peduncular segment 4 with very deep, strongly convex posterior lobe, surface sensory setae short; segment 5 tumid, anterior marginal setae (as in 4) very short and fine; flagellum of 10 short segments, first 2 plumose behind.

Upper lip broad rectangular, apex smooth, slightly indented on either side of midline. Lower lip: outer lobes very large, margin unevenly rounding, inner truncate; inner lobes broad, distally, short pilose. Mandible: left incisor tricuspate, right quadridentate; right lacinia subcylindrical short, bicuspate left lacking; 10–13 accessory blades; palp segment 2 somewhat broadened medially, margins sparingly setose; segment 3 shorter and more slender, more than 30 short comb spines, apex with 11 slender spines. Maxilla 1: inner plate very small, margin with 10 distally plumose setae; outer plate broad, about 16 spine teeth, outermost strongest; palp slender and moderately arched, marginal setae numerous; accessory lobe short, broad, semicircular. Maxilla 2 outer plate nearly as broad as long, margins unevenly rounded, inner proximally with about 20 slender blades, distally with only 9 plumes; inner plate long and

slender, facial row gently sinuous. Maxilliped: inner plate small, nearly uniformly narrow, about 10 inner marginal blades, outer plate much longer, broader, and apex blunt rounded; palp segment 2 short and broad, expanding distally; segment 3 strongly geniculate, width exceeding length, apical angle acute.

Gnathopod 1: coxal plate short and semilunate, posterior angle blunt, 7-setose; segment 2 broadened, both margins convex, anterior with a few plumes, posterior with simple setae; segment 5 powerful, upper margin much longer than lower; segment 6 tumid proximally, anterior margin convex; nail of dactyl stout, long. Gnathopod 2 similar, longer, coxa with about 10 posterolateral plumes; segment 2 long, setose behind; segment 6 longer than 5, more slender and strongly arched than in gnathopod 1, dactyl prominent.

Peraeopod 1: coxal plate strongly semilunate, acute angle with about 8 plumes; segment 2 broad, heavily plumose behind; segment 4: margins plumose; segment 5 with deep posterior lobe, broad circlet of 12 short slender spines and 12 plumose setae; segment 6 broad, spatulate, more than 20 marginal spines, innermost longest. Peraeopod 2: coxal plate very deep, smoothly rounding below, posterior lobe very short, segment 2 richly plumose behind; segment 4 expanding distally, margins plumose; segment 5 short, deep, lobe narrow, circlet of 10 spines and 6 setae; segment 6 elliptical, margin with 12 spines and 8 plumes. Peraeopod 3: coxa very broad, hindlobe with steep setose posterior margin; segment 2 suborbicular, margin finely setose proximally; segment 4 broader than deep, lobe rounding behind, margin with 4–5 spine groups; segment 5 equally broad, very short; segment 6 long, tapering, anterior and terminal spines long and slender. Peraeopod 4: posterior coxal lobe large, oblique, margin rounding below, with numerous short setae; segment 2: posterior margin distally bare; segment 4 long and very broad, posterior margin shallowly convex, with about 12 spines, facial spine clusters in 5 rows; segment 5 much narrower, distal margin short, slightly oblique; segment 6 slender, arched and very long, with 5–6 paired groups of posterior spines. Peraeopod 5: coxal plate shallow, attenuated posteriorly in prominent, acutely pointed lobe; segment 2 extremely broad, anterior margin much longer than posterior, which is nearly bare except for proximal short setae; segment 4: posterior lobe narrow, elongate, proximal, and posterior borders merging into virtually continuous oblique margin, one spine group at "angle"; segment 5 broad and deep, posterior margin convex, 2-spinose, nearly as long as anterior margin; segment 6 broad, tapering distally, distinctly longer than segment 5, margins with 7–8 spine clusters. Gills relatively long and slender, largest anteriorly. Brood plates on peraeopods 1 and 2 very large, 40–60 marginal

setae, smaller on gnathopod 2, short and slender and with 8 long marginal setae on peraeopod 3.

Pleon side plate 3 smoothly convex below and rounded behind, with 5 lateral clusters of 5–9 plumose setae and about 4 anterior singly inserted setae. Pleopod 3: 20-segmented outer ramus distinctly longer than 16-segmented inner ramus. Uropod 1: peduncle stout, strongly arched, posterior margin nearly smooth except for proximal hump bearing a large spine and a row of about 12 stiff setae; 2 very large and strong inter-ramal spines, longest nearly ¾ the inner ramus; outer ramus longer and heavier than inner, both with slender posterior marginal and terminal spines. Uropod 2 larger and stouter than 3. Uropod 3: outer ramus somewhat longer than inner, terminal segment shorter than peduncle. Telson very broad, apex with shallow V-cleft, posterolateral angle of each lobe with about 10 slender spines.

Male, 10.5 mm.: Similar to female but smaller. Antenna 1: flagellum without calceoli.

Remarks.—This large species occurs from the shoreline to depths of more than 20 fms., from the northeast slope of Georges Bank southwards to New Jersey. It is taken frequently in the same bottom sample as *P. holmesi*, a remarkable ecological phenomenon considering the close morphological similarity of the two species.

Neohaustorius, new genus

Small haustoriids. Head very short and broad, rostrum weak, inferior antennal sinus present, lateral margins subparallel. Body very broad, arched above, lateral lobes of peraeon long. Pleosome very short and broad, abruptly narrowing behind peraeon 7, hind-margin slightly deflexed, side plates rounded behind. Urosome stout, longer than pleon 3 but not overhung by pleosome, ventral lappet broad, short; urosome 2 as long as 3, narrower than urosome 1.

Antenna 1: peduncular segments short; flagellum with clusters of elongate calceoli in both sexes; accessory flagellum 2-segmented. Antenna 2: peduncular segment 4 and 5 deeply lobate behind; first flagellum segment elongate.

Upper lip broad, smooth. Lower lip: inner lobes elongate, slender. Mandible without incisor, lacinia monocuspate, accessory blades few (3–5); palp stout, comb row short. Maxilla 1: inner plate with bifid setae; accessory lobe moderate. Maxilla 2 broad, elongate, semilunate, inner margin distally plumose; inner plate long, narrow. Maxilliped plates short and broad, palp segment 3 geniculate.

Gnathopods slender, coxal plates small, rounding below. Gnathopod 2: segment 5 with pectinate spine groups. Peraeopods 1 and 2 weakly fossorial, segment 5 with small posterior lobe. Peraeopods

3–5: distal segments slightly expanded, weakly spinose and plumose; peraeopod 3 nearly equal in length to peraeopod 5. Coxal gills largest posteriorly. Brood plates of gnathopod 2 small, narrow, vestigial on peraeopod 3.

Pleopods moderately strong, outer ramus 12–16 segmented, peduncles short. Uropod 1 uniramous or with short inner ramus. Uropod 2 very small, single ramus spatulate. Uropod 3 stout, rami subequal. Telson small, subquadrate, entire.

TYPE SPECIES.—*Neohaustorius schmitzi*, new species.

ADDITIONAL SPECIES.—*Neohaustorius biarticulatus*, new species.

REMARKS.—This genus is highly specialized for filter feeding but peraeopods are relatively unspecialized for burrowing. The reduction of uropods is the principal distinguishing feature of this genus.

Neohaustorius biarticulatus, new species

FIGURES 1*j*, 2*e*, 4*i*, 16, 17

MATERIAL EXAMINED.—West Falmouth, Mass., Sippewisset Marsh, Feb. 13, 1960, R. L. Wigley: 1 ♀, holotype (NMC 7028). Woods Hole, Mass., east side of Nobska Point, fine sand at low water, July 28, 1962, E. L. Mills: 1 ♀, ov., paratype (NMC 7029).

Cape Cod, Mass., Little Sippewisset Marsh, sand bars near mouth, midwater level, Sept. 8, 1963: 200+ subadult specimens; Great Sippewisset Marsh, sand bars above mouth, midwater level, Sept. 8, 1963: 35 specimens (some ov. ♀♀); Wild Harbor, sand bars near mouth, midwater to low-water levels, Sept. 15, 1963; Herring Brook, sand bars above mouth, midwater level, Sept. 19, 1963, R. L. Wigley: 10 specimens; Old Silver Beach, sand, low water, Feb. 13, 1960: 2 ♀♀; same locality, Jan. 30, 1960: 2 ♀♀ (MBL, author collections).

Note: Two ovigerous females from Herring Brook lack any trace of inner ramus on uropod 1, whereas a small inner ramus is present in the other material.

DESCRIPTION.—Female, 5.0 mm. Head very broad, margins subparallel, rostrum short, anterolateral lobes sharply rounded, flaring outwards. Eyes weakly pigmented. Peraeon lateral lobes well developed. Antenna 1: peduncular segment 1 deep, lateral margin with about 6 heavy plumose setae; segment 2 linear, anterior marginal spines long, cleft tipped; segment 3 short; flagellum 6-segmented; accessory flagellum, outer segment shorter than inner. Antenna 2: posterior lobe of segment 4 deep, broadly arcuate, anterior margins of 4 and 5 with row of simple, stiff setae; flagellum 4-segmented, 1st shorter than 2 and 3 combined.

Upper lip broadly rounded and apically smooth. Lower lip: outer lobes with truncate inner margins, thickly pilose; inner lobes nearly 4 times as long as broad, lightly setose apically. Mandible: lacinia

small, conical; 5 accessory blades; palp short, segment 2 very stout, margins setose; terminal segment subequal, with 8–9 short comb spines and 10–11 slender apical spines. Maxilla 1: inner lobe large, 9 bifid marginal setae; outer lobe small, palp short, apical cluster with simple and plumose setae; accessory lobe large, setae long. Maxilla 2: outer lobe broad lunate, outer margin pilose, inner margin proximally with nearly 20 pectinate slender spines and distally with nearly 30 plumose setae; inner lobe rather broad. Maxilliped: inner plate relatively large, narrowing distally, apex with about 4 slender blades and short prominence with 2 unequal spine teeth; outer lobe with strongly convex outer margin; palp: inner margin of segment 2 convex, segment 3 short, geniculate, medial lobe short.

Gnathopod 1: coxal plate subrectangular, rounding distally, posterior angle with a plumose seta(?); segment 2 rather strongly arched, posterior margin richly setose; segment 5 stout, lower marginal setate simple and cleft tipped; segment 6 shorter, sublinear, marginal setae cleft tipped; dactyl with long stout nail. Gnathopod 2 with 2 plumose setae at squared posterior corner; segment 2 straight, setose behind; segment 4 slightly expanded below (behind), proximally with simple and cleft-tipped setae, distally with about 12 pectinate spines; segment 6 rather short, both margins convex, dactyl small.

Peraeopod 1: coxal plate arcuate, posterodistal angle acute, with 1 long seta; segment 2 stout; segment 4 expanding distally, margins with plumose setae; segment 5 with circlet of 10 lobe spines; segment 6 with 11 marginal spines. Peraeopod 2 smaller and weaker, coxal plate broadly rounding to blunt posterior process; segment 2 short, narrow, setose behind; segment 4 moderately expanded, a few plumose setae anteriorly, simple setae posteriorly; segment 5 and 6 with 4 and 2 long plumose setae on posterior lobes respectively. Peraeopod 3: coxal plate very broad, lobes subequal, margins nearly smooth; segment 2 broadly rounding behind, margin lightly setose; segment 4 expanding distally, subequilateral; segment 5 slightly broader than long, 3 groups of stout facial spines; segment 6 short, cylindrical, terminal spines long. Peraeopod 4: coxal plate with lightly setose posterior lobe; segment 2 broadest distally, posterior margin smooth; segment 4 short, nearly as broad as long, margins heavily plumose, a few short facial spines; segment 5 quadrate; segment 6 short and cylindrical. Peraeopod 5: coxal plate small, rounded behind; segment 2 orbicular, anterior margin with broad plumose blades; segment 4 slightly expanded, no posterior marginal spines; segment 5 narrowing distally; segment 6 somewhat longer, basally broadest. Brood plates of peraeopods 1 and 2 with 17–19 marginal setae, of gnathopod 2 with 4 apical setae; brood plate of peraeopod 3 with 2 minute hairs.

Pleosome side plate 3 with three groups of lateral plumose setae.

Pleopod rami (especially outer) basally broadest; inner ramus with 12 distinct segments, outer with 15.

Uropod 1: peduncle stout, longer than rami, upper margin distally spinose; outer ramus with two groups of posterior spines and terminal spine group; inner ramus much shorter (sometimes lacking) with posterior setae and terminal spines. Uropod 2: ramus slender, narrowly spatulate, setose, longer than weakly setose peduncle. Uropod 3: outer ramus 2-segmented, each distally with setae and spines; inner ramus shorter, with terminal spines and setae; peduncle very short. Telson short, subrectangular, entire, posterior margin with 3 spines on each side.

Male: Unknown.

Remarks.—The inner ramus of uropod 1 was not present in two females of the Herring Brook material, a phenomenon that lessens the significance of the presence or absence of uropod rami as generic characters. The species is known only from short sandy estuaries of the western shore of Buzzards Bay, where it burrows often in company with *Haustorius canadensis* in sandy banks and bars, from low water to about midtide level.

Neohaustorius schmitzi, new species

Figures 1*i*, 2*d*, 4*j*, 18, 19

Material examined.—Morehead City, N.C., Shark Shoal, under algae ash on sandy beach, E. H. Schmitz, Sta. SSB–1, June 15, 1959: 1♀, holotype, 1♂, allotype (NMC 7026). Chatham, Mass., along sandy shore, 2–3 ft., Aug. 26, 1956, R. L. Wigley: 2♂♂, 2 ♀♀, 1 ov. (NMC 2027). Cape Cod region, Nobscusset Beach, open sand shore at low water, Sept. 9, 1963: 2 adult, 2 imm. (MBL, author collections).

Description.—Female, 4.2–5.3 mm. Head short and wide, rostrum broad acuminate, not exceeding anterolateral angles; inferior antennal sinus shallow. Eyes apparently lacking. Lateral lobes of peraeon long, widely separated, coxae shallow. Urosome lappet short. Antenna 1: peduncular segments sublinear, sparsely setose; flagellum 6-segmented, shorter than peduncle; calceoli elongate; accessory flagellar segments subequal. Antenna 2: posterior lobe of peduncular segment 4 narrow, not wider than segment proper, flagellum 4-segmented, 1 longer than 2 and 3 combined.

Upper lip rounded and minutely pilose apically. Lower lip: outer lobes thickly pilose; inner lobes very long and slender. Mandible: lacinia short, conical, 3 slender accessory blades; palp short, terminal segment longer and more slender than 2nd, 6 comb spines, about 10 slender terminal spines. Maxilla 1: inner plate narrow, with 7 bifurcate marginal setae; outer plate with 9 apical spine teeth; palp

with terminal group of nonplumose setae. Accessory lobe of coxopodite small, peripheral setae long. Maxilla 2: outer plate long and slender, lunate, double the inner plate, inner margin proximally with stout comb spines, distally with more than 20 plumose setae, outer margin finely ciliate. Maxilliped: inner plate short, truncate apex with 5 slender spines and one spine tooth on small prominence at inner angle; outer plate narrow, without marginal spine teeth; palp: inner margin of segment 2 slightly concave, terminal segment arcuate, tip not exceeding distal lobe of segment 2.

Gnathopod 1: coxal plate subrectangular, margin sparsely setose; segment 5 strong, posterior setae simple; segment 6 uniformly slender, slightly shorter than 5; dactyl short, nail a simple curved spine. Gnathopod 2: segment 2 straight; segment 5 narrow, lower margin proximally with a few slender setae, distally with about 10 short pectinate spines; segment 6 long and slender, upper margin convex, distally with slender pectinate spines; dactyl relatively large.

Peraeopod 1: coxal plate distally broadest, margins virtually bare; segment 2 strong, margins subparallel; segment 4 slightly expanded, margins sparsely plumose; segment 5 short and deep, spine circlet small, with about 8 spines; segment 6 pear shaped, with 9 spines. Peraeopod 2 slightly shorter, less powerful; coxal plate broadly expanded and produced posteriorly, margins nearly bare; segment 2 slender; segment 4 slightly expanded, upper margin nonplumose (?); posterior margins of segments 5 and 6 with 3 and 1 plumose setae respectively. Peraeopod 3: coxal plate large, deep, posterior margin nearly bare; segment 2 very broad, posterior margin weakly setose, anterior margin with a few plumose setae; segment 4 subtriangular, longer than broad; segment 5 narrow; segment 6 cylindrical, about equal to 5, facial spines short and heavy. Peraeopod 4: posterior coxal lobe shallow, margin nearly bare; segment 2 broader than long, posterior margin smoothly convex, nearly bare, segments 4 and 5 relatively narrow with 2–3 small clusters of stout facial spines; segment 6 short, cylindrical. Peraeopod 5 very nearly equal to 4; segment 2 very brood, strongly convex behind, nearly bare; segment 4: posterior to be subtriangular, segment 6 slender, longer than subrectangular 5. Coxal gills subcylindrical, longest on gnathopod 2, decreasing posteriorly; broad plates long and narrow on peraeopods 1 and 2 with about 20 marginal setae, short and narrow on gnathopod 2, vestigial on peraeopod 3.

Pleosome: side plate 3 small with 3 groups of lateral plumose setae. Pleopods strong, inner ramus 9–10 segmented, outer 12-segmented, inner marginal setae short. Uropod 1: peduncle short, stout, spinose above, single (outer) ramus heavy, with 3–4 groups of stout

posterior spines and longer apical spines. Uropod 2: ramus spatulate, slightly longer and more slender than nearly bare peduncle. Uropod 3: rami subequal, weakly setose apically, longer than peduncle. Telson very small, entire, with 2 short spines and a seta on each side of the slightly emarginate apex.

Male, 3.5 mm.: Somewhat smaller and more slender bodied than female. Antennae 1 with 1 elongate calceolus per flagellar segment. Gnathopods relatively shorter and stouter than in female.

Remarks.—The animal occurs at low-water level of open sandy beaches from the southeast side of Cape Cod Bay and outer coast of the Cape, southwards to Georgia and northern Florida.

This remarkable species is named in honor of Dr. Eugene H. Schmitz, in whose littoral marine amphipod collections from the Beaufort region the species was first identified.

Pseudohaustorius, new genus

Small to medium-sized haustoriids. Head very short and broad, lateral margins subparallel, rostrum and lateral head angles broad, inferior antennal sinus shallow. Lateral lobes of peraeon pronounced. Pleosome abruptly narrowing beyond peraeon 7; segment 2 broadest; posterior margin of segment 3 strongly reflexed below, side plate 3 with posterior spinous process. Urosome very short; urosome 1 very wide, overhung by pleosome, posteroventral lappet short; urosome 2 very short, dorsal margin nearly occluded by 1 and 3, nearly as broad as urosome 1.

Antenna 1: peduncular segments very short and broad, segment 2 heavily plumose anteriorly; accessory flagellum 2-segmented. Antenna 2: segment 4 deeply lobate behind; flagellar segment 1 elongate, plumose. Upper lip broad, apically subtruncate. Lower lip: inner lobe large, rounded. Mandibular incisor unicuspate, lacinia 1–2 cuspate, accessory blades few (3–4); palp stout, comb row long. Maxilla 1: inner plate small, marginal setae few, simple, accessory lobe vestigial or lacking. Maxilla 2: outer plate small, distal margin scantily plumose. Maxilliped short, inner plate small, palp very broad, terminal segment clavate.

Gnathopods slender, coxae broad. Gnathopod 1: dactyl with stout subterminal spine. Gnathopod 2: segment 5 with elongate pectinate spines below. Peraeopods 1 and 2 powerfully fossorial, posterior lobe of segment 5 large, spinose and setose. Coxal plates deep. Peraeopod 3: segments 4 and 5 extremely broad, short. Peraeopod 4: segment 5 articulated near anterior margin of segment 4; segment 6 spatulate. Peraeopod 5: coxal plate large, segment 5 with distinct posterior margin. Coxal gills smallest posteriorly. Brood plate on peraeopod 3 vestigial.

Pleopod outer ramus 15–20 segmented, slightly the longer. Uropods biramous. Uropod 1: rami stout, distally broadening, inner longest. Uropod 2 strong, richly setose, peduncle with stiff spine row. Terminal segment of outer ramus of uropod 3 short or lacking. Telson very broad, shallowly notched, entire, posterior marginal setae long and slender setose.

TYPE SPECIES.—*Pseudohaustorius caroliniensis*, new species.

ADDITIONAL SPECIES.—*Pseudohaustorius americanus* (Pearse) 1908; *Pseudohaustorius borealis*, new species.

REMARKS.—The present genus is similar to *Eohaustorius* Barnard 1957 in general aspect of the antennae, mouthparts, and peraeopods; however, the two genera differ significantly in the form of the maxilliped, lower lip, peraeopod 2, uropod 1, and telson. Similar functional demands may result in convergent evolution of certain appendages in widely separate phylogenetic lines.

Pseudohaustorius caroliniensis, new species

FIGURES 30, 31

MATERIAL EXAMINED.—North Falmouth, Mass., intertidal, Aug. 17, 1951, M. Pettibone: 1 ♀, holotype, 1 ♀, paratype, ov. (USNM collections).

DESCRIPTION.—Female, 6.5–8.0 mm.: Head width more than twice the length, broadest posteriorly; rostrum short and broad, acute; antennal sinus shallow; eyes lacking.

Antenna 1: peduncular segment 3 slender, elongate, terminally bearing 5–6 segmented flagellum; accessory flagellum of two slender subequal segments, markedly subterminal. Antenna 3: peduncular segment 4 deeply expanded posteriorly and distally; segment 5 short, deep; flagellum of 8 unequal segments, subterminal segment longest, proximal segments plumose behind.

Upper lip minutely pilose at apex. Lower lip: inner lobes relatively narrow. Mandible: incisor conical, simple, left lacinia single, right unequally bifid, 3 accessory blades and one supramolar blade; palp with short terminal segment bearing 14 marginal comb spines and 13 slender apical pectinate spines. Maxilla 1: inner plate very small, with 2 marginal setae, outer plate with 11 small spine teeth; palp moderately strong, with marginal plumose setae; accessory baler lobe lacking. Maxilla 2: outer plate small, oblique, distal margin 4–plumose. Maxilliped: inner plate relatively broad and strong; outer plate with weakly toothed inner margin; palp segment 2 with short apical lobe; segment 3 broad clavate and strongly arched.

Gnathopod 1: coxal plate shallow, angle subacute, with 7 plumose setae; segment 5 slightly expanded; segment 6 elongate; dactyl

strong, with stout subterminal posterior spine. Gnathopod 2: coxal plate narrowing below, corner rounded; segment 5 elongate with numerous slender pectinate spines posterodistally; segment 6 short, slightly inflated, dactyl minute.

Peraeopod 1: coxal angle blunt; segment 2 not broadened; segment 4 expanding distally; segment 5: posterior lobe large, directed proximally, with circlet of 16 slender spines and 6 plumose setae; segment 6 with 10 spines and 5 plumose setae. Peraeopod 2: coxal plate narrow, moderately deep, angles subquadrate; segment 2 short, narrow; segment 4 short and very broad, especially distally; segment 5 short and deep, posterior lobe with circlet of 8 slender spines and 5 plumose setae; segment 6 with 7 spines and 5 plumes.

Peraeopod 3: posterior coxal lobe large, margin smooth; segment 2 shallow convex and slightly plumose behind. Segment 4 shallow, very broad, posterior margin truncate, with 2 spines; segment 5 shallower but very wide, facial spines in 3 rows; segment 6 short, linear, length less than width of segment 5, terminal spines long and slender. Peraeopod 4 coxal plate nearly as broad, posterior margin smooth; segment 2 relatively narrow, margin nearly straight, plumose; segment 4 expanding distally, facial spines in 3 vertical rows, 2–6 per cluster; segment 5 trapezoidal, distal margin sharply convex; segment 6 equal to width of 5, terminal spines slender, numerous. Peraeopod 5: posterior coxal lobe broad, very elongate, rounded behind; segment 2: posterior margin relatively small, lightly setose; segment 4 with short posterior lobe, truncate posterior margin with 1 spine group; segment 5 relatively long and narrow, posterior margin with one prominent spine group; segment 6 about equal in length, broad spatulate; marginal spines short and slender. Coxal gills saclike, slender, and shortest posteriorly. Brood plates slender, moderately long; those of gnathopod 2 and peraeopods 1 and 2 with 25–30 marginal setae; brood plate of peraeopod 3 a minute lobe with a few marginal hairs.

Pleosome side plate 3 deeply convex below, posterior spine fairly strong; 4 groups of facial plumose setae, 4–8 per cluster. Pleopods strong, peduncles very broad; inner rami with 12–13 segments, outer with 15 segments.

Uropod 1 small, peduncle slightly shorter than rami; inner ramus expanding distally, with 3 groups of marginal setae, 2–3 per group; outer ramus more slender and with marginal spines and setae. Uropod 2 relatively large, rami and peduncle, strong subequal, richly setose, some of which are plumose. Uropod 3 slightly shorter than uropod 2, rami subequal, terminal segment of outer ramus small and slender; ramal apices with spines and setae, some plumose. Telson short,

broad, shallowly V-cleft behind, lobes each with 12–13 stiff, slender posterior setae and 2 groups of lateral setae.

Remarks.—The present material was compared with the type male specimen of *Pseudohaustorius americanus* (Pearse), from Cameron, La. (USNM cat. 38340), portions of which are illustrated herewith (fig. 5*c*) and in Pearse (1908, p. 29). In the type of *P. americanus*, antenna 1 is damaged and the accessory flagellum appears to retain a minute basal fragment of a terminal segment, thus making the appendage 2-segmented. In maxilla 2, the distal margin of the outer plate is oblique. The terminal segment of the mandibular palp is short. In peraeopod 4, segment 4 is relatively short and broad, segment 5 longer than broad, segment 6 weakly spinose behind. In peraeopod 5, the coxal hindlobe is very large, the hindmargin of segment 2 irregularly convex, the hindlobe of segment 4 short, truncate, with 2 marginal spine groups, and the posterior border of segment 5 apparently long. Terminal spines of the rami of uropod 1 are short, pectinate. Outer ramus of uropod 3 1-segmented. Telson distinctly V-cleft apically.

P. caroliniensis is related closely to *P. americanus* (Pearse), particularly in the shape of peraeopod 5 and telson, but is distinct in possessing a small but definitive terminal segment on the outer ramus of uropod 2. Although recorded from New England by the present material, the species recently has been found in selected habitats of the estuaries of the Carolinas and Georgia. The specific name *caroliniensis* alludes to the principal zoogeographic affinities of the species.

The species is restricted ecologically to surf-protected muddy sand bottoms that are kept moist at low water by beach seeps or tidal runoff. When disturbed or trapped in the net, the animals appear very sluggish and crawl much more slowly than associated species of *Haustorius*, *Acanthohaustorius*, and *Parahaustorius*. Despite intensive search in 1963, the species was not rediscovered at the type locality.

Pseudohaustorius borealis, new species

Figures 1*e*, 2*f*, 4*h*, 20, 21

Material examined.—*Albatross*-101, sta. 86, 41°14′, 67°28′, Smith grab, 24 fms., Aug. 24, 1957: 1♂, holotype, 1♀, allotypes (NMC 7064); same locality: 1♀, 1 imm., paratypes (NMC 7065).

Cape Cod region, off Pasque Island, Quick's Hole, coarse sand, grab at 45 ft., Sept. 18, 1963: 1 ♀, ov. (MBL, author collections). Off Cape Cod, 41°48′, 66°48′, April 10, 1953: 7 subadult; same locality, 41°24′, 66°44′, April 10, 1953: 1 ♀, 2 imm.; *Albatross*-69, coll. 1, 41°52′, 69°60′, Van Veen, Nov. 15, 1955: 5 adult; *Albatross*-101, sta. 68, 41°30′, 68°28′, Smith grab, Aug. 22, 1957: 7 imm.;

Albatross-101, sta. 85, 40°34′, 68°51′, Smith grab, Aug. 23, 1957: 1 frag., 1 imm.; *Delaware*, 59–9, sta. 24, 42°00′, 67°49′ Smith grab, Aug. 6, 1959: 2 imm. (USFW, R. L. Wigley collection). Sta. 186, 40°48′, 68°19′, Smith grab, 31 fms., Aug. 28, 1957: 1 imm. (NMC 7063).

Description.—Male, 6.5 mm. Head more than twice as wide as long, rostrum short, base broad, apex acute; eyes small, slitlike, just inside border of moderately deep antennal sinus; anterolateral angles of head acute.

Antenna 1 distinctly shorter than antenna 2; peduncular segment 1 very deep, lateral margin heavily plumose; segment 3 short; flagellum of 6 segments, segment 1 largest, calceoli not discernible in present material; subterminal accessory flagellum of 2 subequal segments. Antenna 2: peduncular segment 4 as deep as long, lobe extending distally, anterior margin with distal rows of short plumose setae; segment 5 short, broad, anterior setae short, fork tipped, flagellum of 5 segments, 1st much the largest, posterior margin plumose.

Upper lip broad, apex shallow convex, smooth. Lower lip: inner lobes very broad distally, nearly reaching border of broad outer lobes. Mandible incisor simple, conical, lacinia strong, acute, bicuspate on left side, single on right; 3–4 serrate accessory blades; molar process with filelike surface, 1 supramolar blade; palp short, strong, comb row of 10 short spines merging into apical cluster of 14 long, slender distally pectinate spines. Maxilla 1: inner plate very small, with 3 simple marginal setae; outer plate narrow, with 9 spine teeth; palp strongly arched, broadest in middle, outer margin with plumose setae; accessory lobe lacking (not observed in present material). Maxilla 2: outer plate slightly longer than inner, distal truncate margin with 3 plumose setae, inner margin with about 12 slender setae; inner lobe elliptical, facial row of setae straight. Maxilliped: apex of inner plate narrow, twin spines slender, subequal; outer plate margin smoothly convex, palp segment 2 very broad, apical process large, segment 3 short, strongly arched, broadest distally; setae long, simple.

Gnathopod 1: coxa shallow, posterior angle broadly rounding, with about 10 plumose setae; segment 2 somewhat arched, setose behind; segment 5 stout, heavily setose below; segment 6 slender, dactyl strong, with subapical ventral spine. Gnathopod 2: coxa lunate, posterior corner sharply rounded, heavily plumose; segment 2 sublinear, setose behind; segment 5 elongate, lower margin distally with clusters of slender pectinate spines; segment 6 slender subcylindrical, moderately arched, dactyl minute.

Peraeopod 1: posterior coxal angle acute, richly plumose; segment 2 very broad and strong, plumose distally behind; segment 4 convex margins plumose; segment 5: posterior lobe small, circlet of about 18 slender spines and 8 plumes; spatulate segment 6 with 11 spines and 9 plumose setae. Peraeopod 2: coxal plate very deep, with deep posterodistal margin deeply incised, posterior process acute; segment 2 stout, plumose behind; segment 4 short and powerful, convex margins plumose; segment 5 lobe short, circlet of about 10 slender spines and 9 setae, segment 6 with 11 spines and 8 setae.

Peraeopod 3: posterior coxal lobe expanded above and below, lower margin lightly setose; segment 3 orbicular, posterior margin strongly plumose; segment 4: proximal border of posterior lobe incised near base, 2 groups of spines on posterior margin; segment 5 nearly as broad as 4, 2 groups of long posterior spines; segment 6 longer than width of 5, marginal spines long. Peraeopod 4: coxa broad, slightly expanded above and below; segment 2 much broader than deep, posterior border plumose proximally; segment 4 much longer than wide, 3 rows of facial spines in fanwise clusters of 5–8 spines; segment 5 subquadrate, anterior margin convex, extending well forward of border of 4; segment 6 moderately long, subspatulate, 6 clusters of posterior and terminal spines. Peraeopod 5: coxa moderately deep, broadly acuminate and lightly setose behind; segment 2 very broad, smooth behind; segment 4: posterior lobe elongate, subacute, distal border very short, with 1 spine group; segment 5 slightly expanded, posterior border short, with 1 spine group; segment 6 slightly shorter, with 4–5 marginal spine groups and 3 small lateral clusters.

Pleosome side plate 3 deep, convex below, posterior tooth strong; 5–6 groups of lateral plumes setae, up to 10 per cluster. Pleopod peduncles very short and broad; outer ramus 18-segmented, slightly longer than 15-segmented inner ramus. Uropod 1: peduncle slender, weakly spinose; inner ramus with about 3 posterodistal clusters of setae, terminal spines slender; outer ramus slightly shorter, terminal circlet with slender spines and a long seta. Uropod 2: rami subequal, richly setose; stout peduncle with row of slender spines and distal cluster of plumose setae. Uropod 3 shorter than 2, rami broad, subequal, slightly longer than peduncle; terminal segment of outer ramus more than ½ the proximal segment; apex with spines and setae. Telson very broad, posterior margin almost straight, lobes each with 11 stiff slender setae; 2 lateral clusters of setae.

Female, 7.0 mm.: Externally similar to male. Brood plate on gnathopod 2 long and slender, somewhat broader on peraeopods 1 and 2, vestigial on peraeopod 3.

REMARKS.—The genus *Pseudohaustorius* is represented mainly along the coasts of the southeastern United States and the Gulf of Mexico (Bousfield, in prep.). *P. borealis* is probably the most northerly of the component species; hence, the specific name. It differs from *P. americanus* and *P. caroliniensis* mainly in the more elongate and spinose peraeopod 4, the smaller coxa of peraeopod 5, and the uncleft telson. It is also a deeper-water, more offshore species, not uncommon in the Georges Bank region to lat. 42°N.

Genus *Haustorius* Müller 1775

(emendation of Stebbing, 1906, Barnard, 1957)

Medium to large haustoriids. Head broadest medially, lateral margins strongly convex, rostrum strong, sharply acute, antennal sinus deep; body broad, strongly arched, lateral lobes of peraeon well developed; pleosome relatively short, abruptly narrowing beyond peraeon 7; hindmargin of segment 3 strongly decurved or reflexed; side plate (especially 3) margins rounded. Urosome markedly reduced, overhung by pleosome; urosome 1 short, posteroventral lappet well developed; urosome 2 very short.

Antenna 1: peduncular segment 2 margins thickly plumose; flagellum calceolate in both sexes, accessory flagellum 4-segmented. Antenna 2: peduncular segment 5 broad, not lobate behind; flagellum long, noncalceolate in male. Upper lip broad, apically pilose. Lower lip: inner lobes large, subtruncate distally. Mandibular incisor strong, few cuspate, lacina present on one side; accessory blades numerous (9–12); palp long, comb spines numerous. Maxilla: inner plate large, margin richly setose; palp slender; accessory baler lobe very large and long ciliate. Maxilla 2: outer plate extremely large, lunate, richly plumose; inner lobe long, narrow. Maxilliped plates narrow; palp with slender, sharply geniculate terminal segment.

Gnathopods slender, coxae semilunate. Gnathopod 1: dactyl simple, strong. Peraeopods 1 and 2 normally fossorial; posterior lobe of segment 5 in peraeopod 1 with median and marginal spines. Peraeopods 3–5, segments 4–5 broadly expanded. Peraeopods 4 and 5 not greatly longer than peraeopod 3. Peraeopod 4: segment 6 sublinear, not spatulate. Peraeopod 5: posterior border of segment 5 very short. Coxal gills slender, subequal. Brood plates slender, sparingly setose, vestigial on peraeopod 3.

Pleopods very strong, outer ramus 18–22-segmented, inner 15-segmented. Uropods biramous. Uropod 1: inner ramus not shorter than outer, with posterior spines and setae. Uropod 2: peduncle

long, rami short. Uropod 3: outer ramus with distinct terminal segment. Telson sharply incised, lobes apically spinose.

TYPE SPECIES.—*Haustorius arenarius* (Slabber) 1769.

ADDITIONAL SPECIES.—*Haustorius canadensis* Bousfield 1962.

Haustorius canadensis Bousfield 1962

FIGURES 1*d*, 2*a*, 4*g*, 5*a*

Haustorius arenarius.—Paulmier, 1905, p. 157, fig. 25.

MATERIAL EXAMINED.—Saco, Maine, May 30, 1957, F. A. Chace, Jr.: 1 ♀, ov., 17 mm. (MCZ 8992). Brewster, Mass., along sandy shore, 2–4 ft., May 22, 1960, R. L. Wigley: 6 ♀♀, 1 ov., 6 ♂♂, 2 imm. (NMC 7077). Newburyport, Mass., May 26, 1943, C. E. Addy: 1 ♂ (USNM acc. 167331). Woods Hole region, Mass., Aug. 22, 1952 [no other data]: 2 ♂♂, 1 ♀ (USNM collections). Naushon, Mass., Tarpaulin Cove, July 21, 1893, W. P. Hay: 19 ♂♂, 13 ♀♀ (USNM 21827). Cape Cod, Mass., West Falmouth Marsh, 1–3 ft., Jan. 8, 1961, R. L. Wigley: 1 ♂ (NMC 7078). Falmouth, Mass., Sippewisset Marsh, 1–3 ft., Feb. 13, 1960, R. L. Wigley: 5 ♀♀, (br. II), 5 ♂♂, 2 juv. (NMC 7079). Newport, R.I., May 1893, S. D. Judd: 10 ♀♀, 7 ov., 19 ♂♂ (USNM acc. 34225); same locality, second lot: 9 ♂♂, 12 ♀♀. Sagaponack Lake, 3 miles south of Bridgehampton, N.Y., Aug. 18, 1938, H. K. Townes: 4 ♂♂, to 17 mm (USNM acc. 149428). Arundel-on-the-Bay, Md., W. P. Hay: 115 specimens (USNM acc. 22157).

Cape Cod region, Mass.: Little Sippewisset Marsh, sand banks near mouth of estuary, low water to midwater, Sept. 8, 1963: 4 ♀♀, 2 ♂♂, 3 imm.; Great Sippewisset Marsh, sand bars above mouth, midwater level, Sept. 8, 1963: 1 imm.; Nobscussett Beach, sand flats at breakwater, midwater level, Sept. 9, 1963: 1 imm. (MBL, author collections). Northern New England, 1963: 431 specimens obtained at 8 stations, mostly from inter-tidal sandbanks at the mouths of small estuaries, from East Sandwich, Mass., north to Biddeford Pool (Casco Bay), Maine, including Plum Island, Mass., Seabrook Beach, N.H., Cape Neddick Beach, Ogunquit, Pine Pt., Maine (NMC, author collections).

REMARKS.—Material from New England, particularly from Connecticut and Long Island region, reaches a larger size (to 18 mm.) and has a more pronounced rostrum (fig. 1*d*) than specimens from the Gulf of St. Lawrence. The smaller, short rostrate type occurs throughout the Cape Cod region and northward. The large animals (17–18 mm.) are probably adults that have survived into the second year of reproduction.

The material of Paulmier (1905) now can be referred with certainty to this species. The known range is from the Gulf of St. Lawrence to Chesapeake Bay. A similar but long rostrate form occurs from North Carolina southwards (Bousfield, in prep.). The species is confined to the intertidal and wave zone sandbars and banks, especially at the mouths of estuaries. The animal burrows in the sand to a depth of 4 inches or more when the tide is out.

Acanthohaustorius, new genus

Small to medium large, generally similar to *Haustorius* (sensu stricto). Head broadest medially, margins convex, rostrum broadly acute. Peraeon lateral lobes prominent. Pleon narrowing abruptly behind peraeon, side plates acuminate, 3rd produced posteriorly into stout spinous process. Urosome somewhat reduced, longer than pleon 3, which overhangs it more or less. Urosome 1 stout, postero-ventral lappet short. Urosome 2 as long as urosome 3, but narrower than uropod 1.

Antenna 1: flagellum usually calceolate, accessory flagellum 2-segmented. Antennae 2: peduncular segment 4 deeply lobate, segment 5 broad, setose; flagellum: basal segment largest. Upper lip broad rectangular, apex smooth. Lower lip: inner lobes broad; outer lobes: inner margin subtruncate. Mandibular incisor mono- or bicuspate, lacinia simple on right side only, accessory plates fairly numerous (5–13). Maxilla 1: inner plate setae distally plumose; accessory baler plate moderately large. Maxilla 2: outer plate broad, not elongate, apex blunt, inner margin plumose distally; inner plate narrow. Maxilliped: plates broad; palp segment 3 stout, geniculate.

Gnathopod 1: segment 5 usually stout. Gnathopod 2: segment 6 slender. Peraeopods 1 and 2 not exceptionally powerful, posterior lobes of segment 5 short, coxa of peraeopod 2 very broad. Peraeopods 3–5: segments 4–5 moderately expanded. Peraeopods 4 and 5 not excessively lengthened, peraeopod 3 more than ⅔ peraeopod 5. Coxal gills smallest posteriorly. Brood plates rather large, broad, margins richly setose, very small on peraeopod 3. Pleopods strong, outer ramus 13–20-segmented, inner 10–15-segmented. Uropod 1: peduncle stout, inner ramus shorter, spinose and setose behind. Uropod 2 strong, rami and peduncle subequal. Uropod 3: terminal segment of outer ramus long. Telson broad, sharply and deeply notched.

Type species.—*Acanthohaustorius millsi*, new species.

Additional species.—*Acanthohaustorius intermedius*, new species; *A. spinosus* (Bousfield) 1962; *A. shoemakeri*, new species.

***Acanthohaustorius millsi*, new species**

FIGURES 1*b*, 3*f*, 4*b*, 22, 23

MATERIAL EXAMINED.—Woods Hole, Mass., Stony Beach, sand, subtidal, June 29, 1961, E. L. Mills: 1 ♀, ov., holotype (NMCM 7050); same locality: 5 ♀♀, paratypes (NMC 7051). Cape Cod, Mass., near Nobska Point, sandy beach below low water, Aug. 16, 1959, E. L. Mills: 125 specimens, including ♂♂ and ♀♀ ov. (NMC 7052). Woods Hole, Mass., east end of Nobska Beach, fine sand at low water, Aug. 26, 1961, E. L. Mills: 64 specimens including ♂♂, ♀♀, ov., 1 imm. (NMC 7053); east side Nobska Point, fine sand, low water, July 28, 1962, E. L. Mills: about 200 specimens (NMC 7054). Cape Cod, Mass., Marshfield, coarse sand, low water, Aug. 20, 1961, D. Frankenberg: 4 ♀♀, 3 ov., 2 ♂♂, 9 imm. (NMC 7055); Nobska Beach, sand at low water, May 12, 1962, E. L. Mills, E. L. Bousfield: 10 ♀♀, 8 ov., 9 ♂♂, 2 imm. (NMC 7056); Barnstable Harbor, sandy channel opposite town wharf, low water, May 13, 1962, E. L. Bousfield, E. L. Mills, E. Deichmann: 12 ♀♀, 9 ov., 12 ♂♂, 6 imm. (NMC 7057). Falmouth, Mass., Sippewisset Marsh, sand, 1–3 ft., Feb. 13, 1960, R. L. Wigley: 11 ♀♀ (br. II), 1 ♂ (NMC 7058). Brewster, Mass., sand, 2–4 ft., May 22, 1960, R. L. Wigley, 1 imm. (NMC 7059). *Albatross*-101, sta. 86, 41°14′, 67°28′, Smith grab, 24 fms., Aug. 24, 1957: 1 imm. (NMC 7060). *Albatross*-101, sta. 89, 41°29′, 67°28′, Smith grab, 27 fms., Aug. 24, 1957: 4 ♂♂ (NMC 7061). *Albatross*-101, sta. 186, 40°48′, 68°19′, Smith grab, 31 fms., Aug. 28, 1957: 4 ♂♂, 1 ♀ (br. II) (NMC 7062). Isles of Shoals, N.H., N.W. 146, D2, July 19, 1937: 1 imm. (USNM 668/541).

Cape Cod region, Cedar Island (Nonamesset Island), Nobska Beach, Megansett breakwater, Little Sippewisset Beach, Nobscusset Beach, Wild Harbor, Herring Brook, Narragansett Beach, mouth of Pattaquamsett Inlet, sandy bottoms, low water, September 1963: 1000+ specimens (MBL, author collections). Chatham, Mass., Feb. 22, 1960: 19 adults; Old Silver Beach, Jan. 31, 1930: 47 subadults; same locality, Feb. 13, 1960: 2 ♀♀, 9 imm. Woods Hole, Ram Island, July 16, 1955: 2 adults; Vineyard Sound, L. Tashmoo, Nov. 13, 1962: 3 adults; same locality, Middle Ground, from *Blueback* 62–1, April 5, 1912: 15 adults; *Albatross*-69, coll. 1, 41°52′, 69°60′, Van Veen, Nov. 15, 1955: 7 adults; *Albatross*-101, sta. 68, 41°06′, 68°00′, Smith grab, Aug. 24, 1957: 1 adult.

Northern New England, 1963: about 1150 specimens obtained at 16 localities, from East Sandwich and the Cape Cod Canal north to Casco Bay and Pemaquid Beach, Maine, including Rockport and Plum Island, Mass., Cape Neddick Beach, and Ogunquit, Maine (NMC, author collections).

DESCRIPTION.—Female, 5.5–8.0 mm. Head width about twice the length, lateral margins evenly convex, rostrum stout, blunt conical, eyes very small, weakly pigmented, just inside margin of antennal sinus.

Antenna 1: peduncular segment 1 very deep, with numerous plumose setae; segment 2 anterior margin with numerous long distally plumose setae; segment 3 short, linear; flagellum 6-segmented, calceolate, elongate; accessory flagellum of 2 long subequal segments. Antenna 2: peduncular segment 4 very deeply lobed behind, margin richly plumose, face with 2 rows of plumose bladelike setae; segment 5 short and broad; flagellum 7-segmented, lst longest, proximal 4 segments with posterior plumose setae.

Upper lip broad, apex almost bare. Lower lip: inner lobes broadening distally, apices subtruncate, pilose. Mandible: incisor bifid; lacinia short, slender; accessory blades 7, molar process large, 2 supramolar blades; palp segment 2 broadest proximally, 3rd uniformly slender, 18 spines in comb row, 12–13 slender apical spines. Maxilla 1: inner plate small with 10 setae; outer plate with 12 slender spine teeth; palp short, with simple marginal and terminal setae; accessory lobe moderately developed. Maxilla 2: outer plate very broad, outer margin short pilose, inner margin proximally with 14 slender pectinate spines and distally with about 20 plumose setae; inner lobe narrow, facial row strong, sinuous. Maxilliped: outer plate much broader than inner, palp rather slender, segment 2 produced distally almost to long transverse margin of geniculate segment 3; terminal setae very long, many bifid at tip or minutely pectinate.

Gnathopod 1: coxal angle acute, with about 8 long plumose setae; segment 2: posterior margin simply setose; segment 5 very strong and inflated, lower margin richly setose; segment 6 slender, convex anterior margin with several clusters of long club-tipped setae; dactyl short, simple. Gnathopod 2: coxal angle acute, rounded, with about 12 plumose setae; segment 2 slender, gently sinuous; segment 5 slightly inflated, lower margin distally with about 4 clusters of pectinate spines; segment 6 slender, gently arched, a few anterior setae plumose.

Peraeopod 1: coxal plate semilunate, posterior angle very acute, posterior margin with more than 12 plumose setae; segment 2 linear; segment 4: subparallel margins with several long plumose setae; segments 5 and 6 with about 10 slender marginal spines and 4 plumose setae. Peraeopod 2: coxal plate broad and deep, posterior sinus shallow; segment 2 short, linear; segment 4: distally expanding margins with several plumose setae; segments 5 and 6 with 9–10 slender spines and 4–5 plumose setae. Peraeopod 3: posterior coxal lobe the larger, margin distally setose; segment 2: smoothly convex

posterior margin with proximal setae; segment 4 broader than deep, one group of posterior spines and 4–6 groups of facial spines; segment 5 much broader than long, posterior lobe produced distally, 3 rows of facial spines; segment 6 linear, with 5 groups of anterior spines and a few long terminal spines. Peraeopod 4: coxal plate shallow; segment 2 not broader than deep; segment 4 with about 5 posterior marginal spines and 3 rows of short facial spines; segment 5 quadrate, posterior margin nearly straight; segment 6 short and linear with 3 posterior spine groups and longer terminal spines. Peraeopod 5: coxal plate with subacute posterior lobe; segment 2 orbicular, posterior margin virtually bare; segment 4 short, posterior lobe considerably produced, posterior margin short, with 2 spines; segment 5 longer than 6, distally broadest, with virtually no posterior margin, facial groups of setae only; segment 6 basally broad, marginal spines rather long. Brood plates broad, long, those of peraeopods 1 and 2 with 30–50 marginal setae, that of gnathopod 2 smaller; plate of peraeopod 3 a small lobe with 6–7 marginal hairs. Coxal gills elongate anteriorly.

Pleosome side plate 3 produced posteriorly into a long stout spur or spine; about 6 clusters of lateral plumose setae. Side plates 1 and 2 posteriorly acuminate. Pleopods with rather slender rami; inner 12-segmented, outer 17-segmented.

Uropod 1: peduncle slender, longer than rami, posterior margin with a few slender spines; 3 short inter-ramal spines; rami slender, spinose above, terminal spines long; inner ramus with 4 long, singly inserted, marginal setae and terminal spine cluster. Uropod 2: rami and peduncle subequal, densely setose. Uropod 3: outer ramus slightly longer than inner, 2 segments subequal, distally with numerous long simple setae; peduncle slender. Telson broad, cleft nearly to base, lobes strongly arched medially, margin with slender spines.

Male, 4.5–7.0 mm.: Very similar to female, slightly smaller. Antenna 2 noncalceolate. Slender penes arise ventrally on peraeon 7 near base of coxae, and are directed medially.

Remarks.—This is one of the most common species of semiprotected sand beaches in the Cape Cod region. Like *Protohaustorius deichmannae*, it is common northward to Casco Bay, Maine, but is not known from Canada. The species probably extends much further southward than the present New England records indicate. It occurs from the lower intertidal zone to depths of 27 fathoms and in salinities from estuarine to fully marine. The species is named in honor of Dr. Eric L. Mills, who collected the material from which this and other new haustoriid species initially were recognized.

***Acanthohaustorius intermedius*, new species**

FIGURES 1*c*, 3*e*, 4*a*, 24, 25

MATERIAL EXAMINED.—Barnstable Harbor, Mass., Beach Point, coarse sand, low water, 12°C., May 19, 1962, E. L. Mills: 1 ♀, holotype, 1 ♂, allotype (NMC 7046); same locality: 6 ♀♀ (5 ov.), 3 ♂♂, paratypes (NMC 7047). *Albatross*-101, cruise 70, coll. 5, 40°51′, 68°20′, Digby bag, 25 fms., Dec. 7, 1955: 1 ♂ (NMC 7048). *Albatross*-101, sta. 86, 41°14′, 67°28′, Smith grab, 24 fms., Aug. 24, 1957: 2 ♀♀, 3 imm. (NMC 7049). U.S. Fish Comm. *Fish Hawk* sta. 1802, 1874: 10 adult specimens. Cape Cod Bay, Nobscussett Beach, open sand near breakwater, low-water level, Sept. 9, 1963: 5 adult, 45 imm. (MBL, author collections). *Albatross*-101, sta. 63, 41°26′, 68°19′, Smith grab, Aug. 24, 1947: 2 ♀♀, ov.; *Albatross*-101, sta. 70, 40°57′, 67°52′, Smith grab, Aug. 24, 1957: 2 adults; Vineyard Sound, Middle Ground, from *Blueback*, April 5, 1962: 12 adults (USFW, R. L. Wigley collection).

DESCRIPTION.—Female, 4.5 mm. Head wider than long, outer margins smoothly convex, rostrum broad and blunt, antennal sinus moderately deep. Eyes apparently lacking. Body strongly arched. Pleosome segments very broad; margin of pleon 3 produced middorsally as a large blunt-conical posterior process.

Antenna 1: peduncular segment 1 very short, deep, segment 2 subequal in length; flagellum of 5 slender segments, accessory flagellum equally 2-segmented. Antenna 3 peduncular segment 4 with short posterior lobe; segment 5 tumid; flagellum 5-segmented, 2nd segment smallest. Upper lip: apex smooth. Lower lip: inner lobes very broad apically. Mandibular incisor simple, incisor unicuspate, 5 accessory blades; palp slender, comb row of 9 short spines, apex with 9 slender spines. Maxilla 1: inner plate small, with 7 marginal setae; palp short, sparingly setose; accessory baler lobe shallow. Maxilla 2: outer plate expanded, length about 1½ times the inner plate, apex blunt, inner margin distally with about 12 plumose setae. Maxilliped: inner plate short, broad; outer plate convex laterally; palp short and broad, terminal segment stout, distal margin short.

Gnathopod 1: coxa rounded below, with 3 posterior plumose setae; segment 2 linear; segment 5 moderately expanded, ventral setae cleft tipped; segment 6 much shorter. Gnathopod 2: coxa with 7 posterior setae; segment 2 very slender; segment 5 longer than linear segment 6, with 3 groups of ventrodistal comb spines.

Peraeopod 1: coxal plate semilunate, posterior margin with 8 plumose setae; segment 4 not expanded, weakly plumose; segment 5 shallow, posterior lobe with 10 circlet spines and 1 plumose seta; segment 6 small, with 8 marginal spines. Peraeopod 2: coxal margin strongly convex below, segment 4 little expanded, margins plumose;

segment 5 very short, lobe circlet with 5 spines and 5 plumose setae; segment 6 slender, with 8 spines and 3 setae.

Peraeopod 3 relatively large, length more than ⅔ peraeopod 4. Coxal plate deeply lobate, hindmargin weakly setose; hindmargin of segment 2 nearly straight, proximally setose; segment 4 about as wide as long, outer face with 6–7 clusters of spines; segment 5 much narrower, 3–4 spine clusters; segment 6 short and stout, terminal spines long. Peraeopod 4: coxal plate small, posterior margin oblique, setose below; segment 2 relatively narrow, setose proximally; segment 4 triangular, posterodistal margin with 3–4 long spines; segment 5 subquadrate, distal margin straight, perpendicular to long axis, anterior marginal spines long; segment 6 short, linear, 3 posterior spine clusters. Peraeopod 5: coxa shallow, subtruncate behind; segment 2 large, orbicular, posterior margin bare, anterior margin distally with long bladelike setae; segment 4: posterior lobe short, acute, hindmargin very short, 1 spine group; segment 5 triangular, posterior margin distinct, 1 spine group, anterior marginal spines elongate, cleft tipped; segment 6 short, cylindrical, terminal spines long. Posterior coxal gills short, saclike. Brood plates on peraeopods 1 and 2 narrow, about 20 marginal setae, short and slender with 8 apical setae on gnathopod 2, a small plate with 2 apical hairs on peraeopod 3.

Pleon side plate 3 with short, weak, posterior spinous process. Pleopod rami short, broad, outer 13-segmented, inner 9–10 segmented. Uropod 1: peduncle long, evenly spinose posteriorly; 3 moderately strong inter-ramal spines; inner ramus much shorter than outer, hindmargin with 3 singly inserted setae; outer ramus with terminal cluster of long spines. Uropod 2: rami and peduncle subequal, some setae plumose. Uropod 3: rami subequal, segments of outer ramus subequal. Telson broad, narrowly cleft almost to base, lobes apically with a few slender setae.

Male, 3.5 mm.: similar but smaller than female; calceoli on first 4 flageller segments of antenna 1 elongate, each about equal to 2 flagellar segments.

Remarks.—Several features of this species (e.g., relatively small outer plate of maxilla 2, short terminal segment of maxilliped, weakly expanded peraeopods, short spinous process of pleon 3, and short inner ramus of uropod 1) are intermediate between the condition in primitive haustoriids (e.g., *Protohaustorius*) and the condition in highly specialized members of the genus *Haustorius;* hence, the specific name *intermedius*.

The species is known only from the Cape Cod region and occurs sparingly from the shoreline (in Cape Cod Bay) to more than 20 fathoms (on Georges Bank).

Acanthohaustorius spinosus (Bousfield) 1962

FIGURES 1*a*, 3*d*, 4*c*, 26, 27

MATERIAL EXAMINED.—Gulf of Maine, *Delaware* dredge haul no. 5, sta. 100, 42°41′, 66°28′, 80 fms., Aug. 8, 1959: 1 ♀ (br. II), (NMC 7044). Scotian Shelf, 100 miles off Halifax, *A. T. Cameron* sta. 64, 43°32′, 63°01′, dredge haul, 100 fms., May 8, 1961, S. W. Gorham: 11 ♀♀, 6 ov., 10 ♂♂, 5 imm. (NMC 7045).

Vineyard Sound, Mass., Quick's Hole, SE entrance, sand, 45 ft. grab. Sept. 18, 1963: 14 adult, 6 imm. (MBL, author collections). No. 540, 67°27′, 41°02′, June 17, 1953: 1 ♂, (USFW, R. L. Wigley collections).

REMARKS.—Author's figures (1962b) are reproduced here (with slight alterations) for comparative purposes and generic diagnosis.

The present material contains males of 6–8 mm. in size. These are similar to the females in external appearance. Antennae 1 and 2 apparently lack calceoli in either sex. This species shows features that are akin to the genus *Parahaustorius*, namely, the strongly spinose peduncle of uropod 1, the shortened urosome segment 2, the relatively small peraeopod 3, and the posteriorly broadening head. The subspatulate form of segment 6 of peraeopod 4, and the broadly subtruncate telson, apically long setose, are typical of the genus *Pseudohaustorius*. Until further material can be studied, it seems advisable to define the genus *Acanthohaustorius* sufficiently broadly to include *A. spinosus*. This species has a remarkable bathymetrical range, from the lower intertidal of sandy beaches in the Bay of Fundy to depths of 100 fathoms on the Scotian Shelf. The present records extend its geographical range southward to Georges Bank and the south side of the Cape Cod peninsula.

Acanthohaustorius shoemakeri, new species

FIGURES 28, 29

MATERIAL EXAMINED.—Marthas Vineyard, Mass., off Gay Head, *Fish Hawk* sta. 1126–28, 9–14 fms., Aug. 28, 1882: 1 ♀, holotype, 1 ♀, ov., paratype (USNM 33727).

DESCRIPTION.—Female, 6.0–6.5 mm. Head shape similar to that of *A. intermedius;* eyes not observed in present material.

Antenna 1: peduncular segment 2 slender, nearly equal to segment 1; flagellum 9–10-segmented; accessory flagellum of 2 slender subequal segments, subterminally attached to peduncle 3. Antenna 2: peduncular segment 4 moderately deep, smoothly convex and richly plumose behind; flagellum 7-segmented, 1st longest, plumose posterodistally.

Upper lip smooth. Lower lip: inner lobes short, broad; outer lobes smoothly rounding, inner margin with about 7 well-spaced bristles. Mandible: incisor and lacinia short, unicuspate; 8 accessory blades and 1 supramolar blade; palp segments 2 and 3 slender, subequal; comb row of 20 short spines; 13 slender terminal spines. Maxilla 1: inner plate with 12 dendritic marginal setae; outer plate with 11 spine teeth; palp short, setae simple; accessory baler lobe moderately strong. Maxilla 2 longer than broad, inner margin with 18 proximal spines and 20 distal plumose setae; inner lobe long and narrow. Maxilliped inner plate with 12 marginal bristles; outer plate broad, with strong inner marginal spine teeth; palp slender; segment 2: apical lobe with straight outer margin, inner margin with minutely pectinate, curve-tipped setae.

Gnathopod 1: coxal angle broadly rounded, plumose; segment 2 slender; segment 4 powerful, posterior marginal setae clavate; dactyl with simple terminal nail. Gnathopod 2: coxal angle broad, plumose; segment 2 very slender, sinuous; segment 4 slightly expanded, with 4 groups of posterodistal pectinate spines; segment 6 very slender, chela relatively large.

Peraeopod 1: coxal plate deep, semilunate; segment 4 distally expanding, margins distally plumose; segment 5 long, with 14 marginal spines and 2 plumose setae; segment 6 with 10 spines and 3 plumose setae. Peraeopod 2: coxal plate broad, posterior marginal sinus moderately deep; segment 2 linear; segment 4 short, expanded, margins plumose; segment 5 small, with 6 marginal spines and 4 plumose setae; segment 6 with 10 spines and 3 plumose setae.

Peraeopod 3: posterior coxal lobe slightly the larger, weakly setose behind; segment 4 slightly broader than deep, with 5 groups of facial spines; segment 5 narrower, with 1 group of posterior spines, segment 6 stout, terminal spines not exceptionally long. Peraeopod 4: segment 2 nearly smooth behind; segment 4 short with 2 rows of facial spines, posterior margin concave proximally, convex distally, and armed with about 5 strong spines; segment 5 quadrate, distal margin perpendicular to axis, anterior marginal spines long; segment 6 linear with 4–5 posterior spine groups. Peraeopod 5: coxal plate deep, posterior lobe short, acute; segment 2 orbicular; segment 4: posterior lobe moderately produced, tapering to short posterior margin bearing 3–4 slender spines among plumose seatae; segment 5 with few facial setae, anterior marginal spines long, cleft tipped; segment 6: marginal spines long.

Brood plates of peraeopods 1 and 2 long and broad, with 35–40 marginal setae; that of gnathopod 2 much shorter, with 12 distal setae; that of peraeopod 3 forming a slender lobe with 4–5 posterodistal setae. Anterior coxal gills slender, elongate.

Pleosome side plate 3 with strong posterior spine and 6 facial clusters of plumose setae, 5–10 per cluster; side plates 1 and 2 acuminate behind, lower margin of side plate 1 strongly incised. Pleopods: rami with 13–16 distinct segments; peduncles each with 2 coupling spines.

Uropod 1: peduncle stout, posterior margin lined with strong spines, largest distally; outer ramus strong, nearly equal in length to peduncle, margins distally spinose; apical spines long; inner ramus weak, tapering distally, with a few weak posterior spines and slender setae. Uropod 2 large, rami and peduncle subequal, densely setose. Uropod 3: rami long and slender, outer ramus with subequal segments each longer than peduncle. Telson very broad, shallow, and deeply cleft; lobes rounded behind, margins with numerous slender stiff setae.

Remarks.—This species is generally similar to *A. millsi* but more closely resembles *A. intermedius* in shape of head, peraeopod 5, and uropod 1. The limited material at hand suggests it is a deeper water offshore species of sandy mud bottoms. The species is named in recognition of the significant contributions to the systematics of North American haustoriid amphipods made by the late Mr. C. R. Shoemaker and for his preliminary unpublished diagnoses of several of the species described in this paper.

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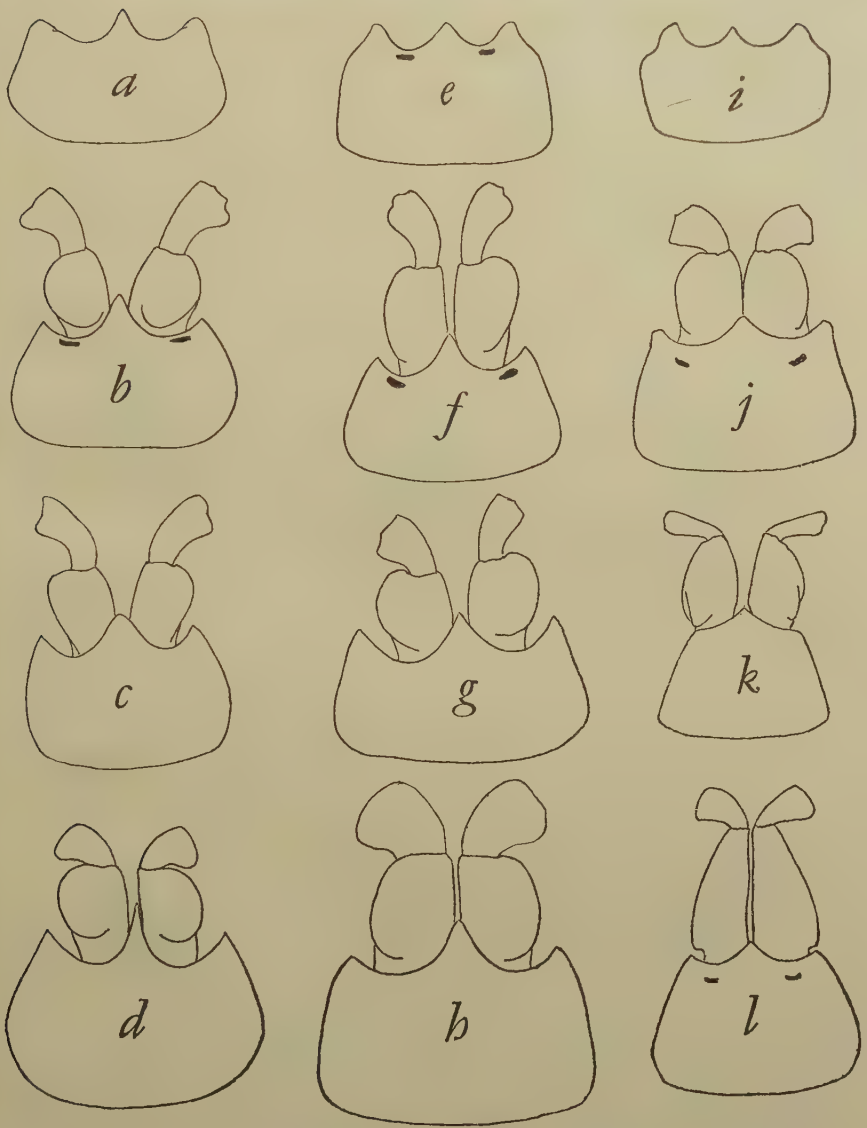

FIGURE 1.—Head and antennal peduncular segments, dorsal aspect: *a*, *Acanthohaustorius spinosus* (Bousfield) 1962, ♀, 12.5 mm., Sandy Cove, N.B.; *b*, *A. millsi*, new species, ♀, 8.0 mm., Nobska Beach, Mass.; *c*, *A. intermedius*, new species, ♀, 4.5 mm., Barnstable Harbor, Mass.; *d*, *Haustorius canadensis* Bousfield 1962,♀, 11.3 mm., Newport, R.I.; *e*, *Pseudohaustorius borealis*, new species, ♂, 6.5 mm., off Cape Cod, *Albatross*-101, sta. 86; *f*, *Parahaustorius longimerus*, new species, ♀, 10 mm., Barnstable Harbor, Mass.; *g*, *P. attenuatus*, new species, ♀, 14 mm., off Block Island, N.Y.; *h*, *P. holmesi*, new species, ♀, 10 mm., Vineyard Sound, Mass.; *i*, *Neohaustorius schmitzi*, new species, ♀, 4.5 mm., Morehead City, N.C.; *j*, *N. biarticulatus*, new species, ♀, 5.0 mm., Nobska Beach, Mass.; *k*, *Protohaustorius deichmannae*, new species, ♀, 6.0 mm., Barnstable Harbor, Mass.; *l*, *P. wigleyi*, new species, ♀, 7.5 mm., off Cape Cod, *Albatross*-101, sta. 89.

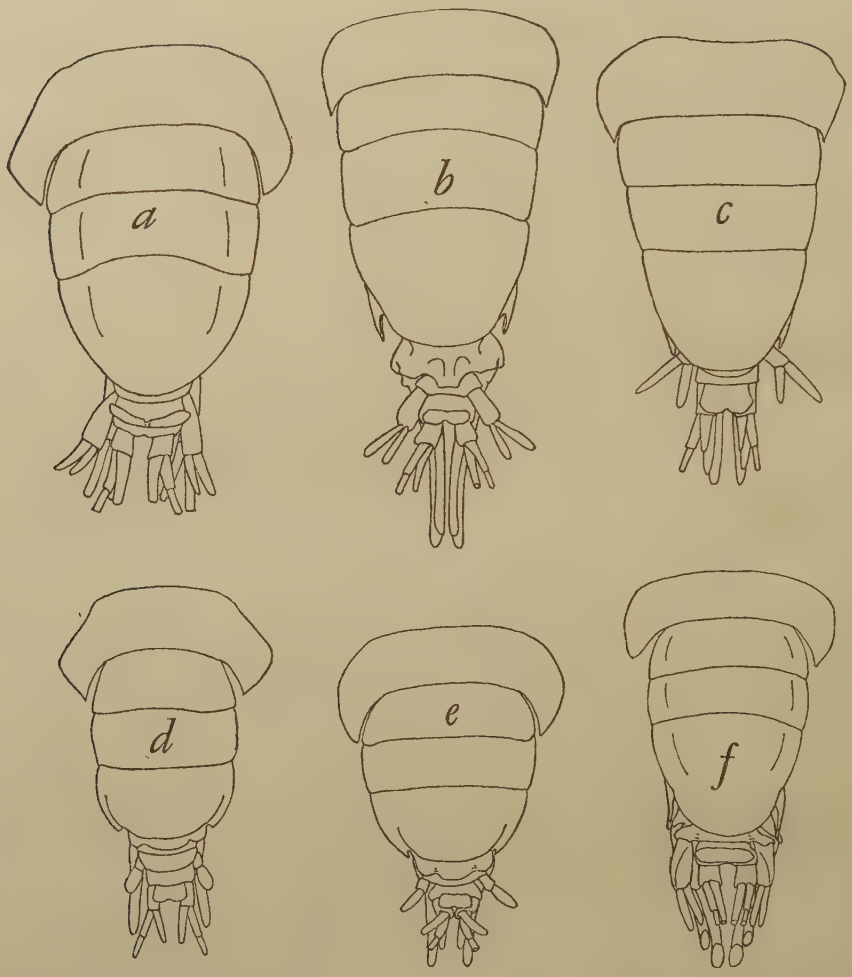

FIGURE 2.—Abdomen and peraeon 7, dorsal aspect: *a*, *Haustorius canadensis* Bousfield 1962; *b*, *Protohaustorius wigleyi*, new species; *c*, *P. deichmannae*, new species; *d*, *Neohaustorius schmitzi*, new species; *e*, *N. biarticulatus*, new species; *f*, *Pseudohaustorius borealis*, new species.

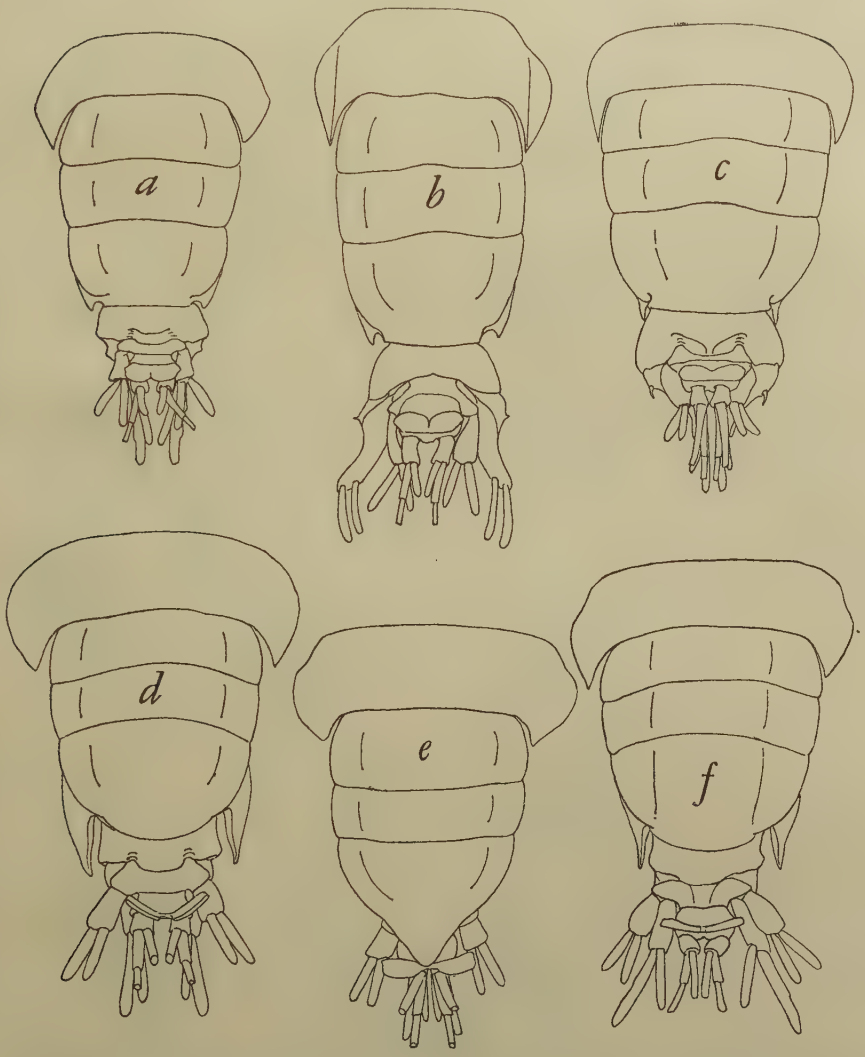

FIGURE 3.—Abdomen and peraeon 7, dorsal aspect: *a*, *Parahuastorius longimenus*, new species; *b*, *P. holmesi*, new species; *c*, *P. attenuatus*, new species; *d*, *Acanthohaustorius spinosus* (Bousfield) 1962; *e*, *A. intermedius*, new species; *f*, *A. millsi*, new species.

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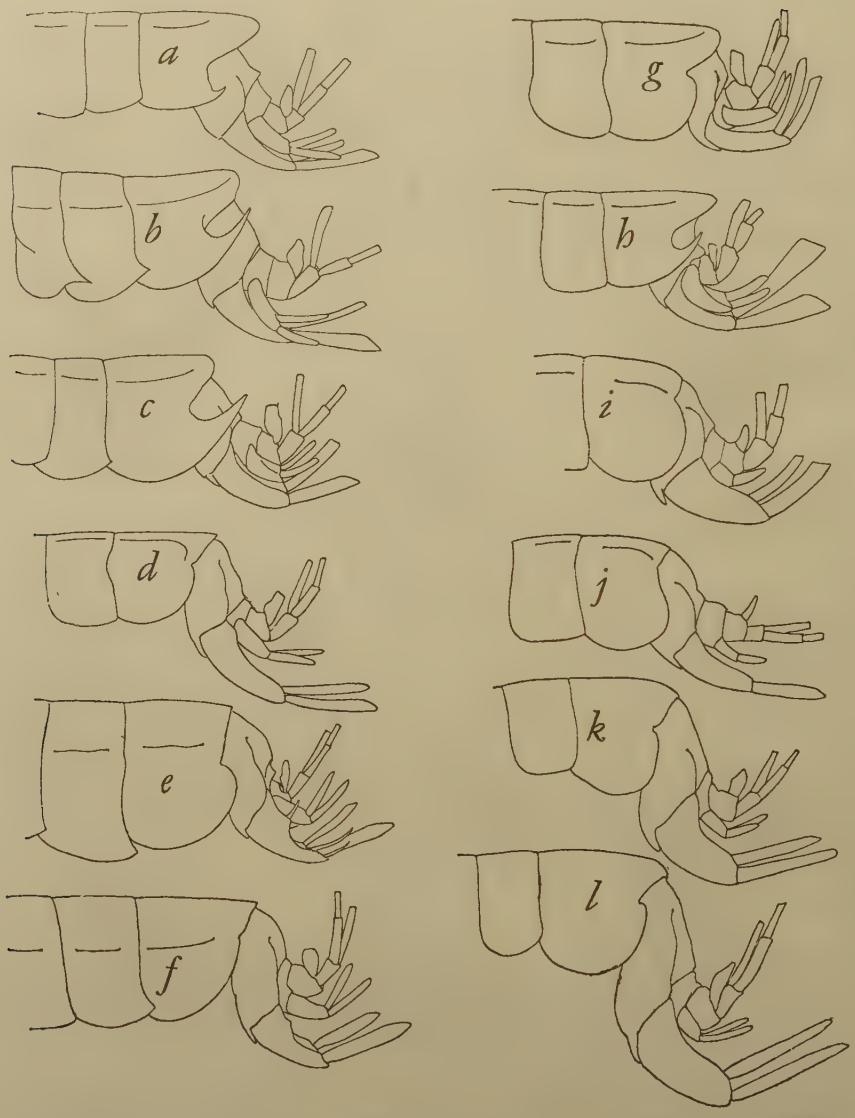

FIGURE 4.—Abdomen, lateral aspect: *a*, *Acanthohaustorius intermedius*, new species; *b*, *A. millsi*, new species; *c*, *A. spinosus* (Bousfield) 1962; *d*, *Parahaustorius longimerus*, new species; *e*, *P. attenuatus*, new species; *f*, *P. holmesi*, new species; *g*, *Haustorius canadensis* Bousfield 1962; *h*, *Pseudohaustorius borealis*, new species; *i*, *Neohaustorius biarticulatus*, new species; *j*, *N. schmitzi*, new species; *k*, *Protohaustorius deichmannae*, new species; *l*, *P. wigleyi*, new species.

FIGURE 5.—Body appendages: *a*, *Haustorius canadensis* Bousfield 1962, Keppoch Beach, P.E.I.; *b*, *H. arenarius* (Slabber) 1769, Lokken, Denmark; *c*, *Pseudohaustorius americanus* (Pearse) 1908, Baton Rouge, La.

FIGURE 6.—*Protohaustorius deichmannae*, new species, ♀, 6.0 mm., holotype, Barnstable Harbor, Mass.

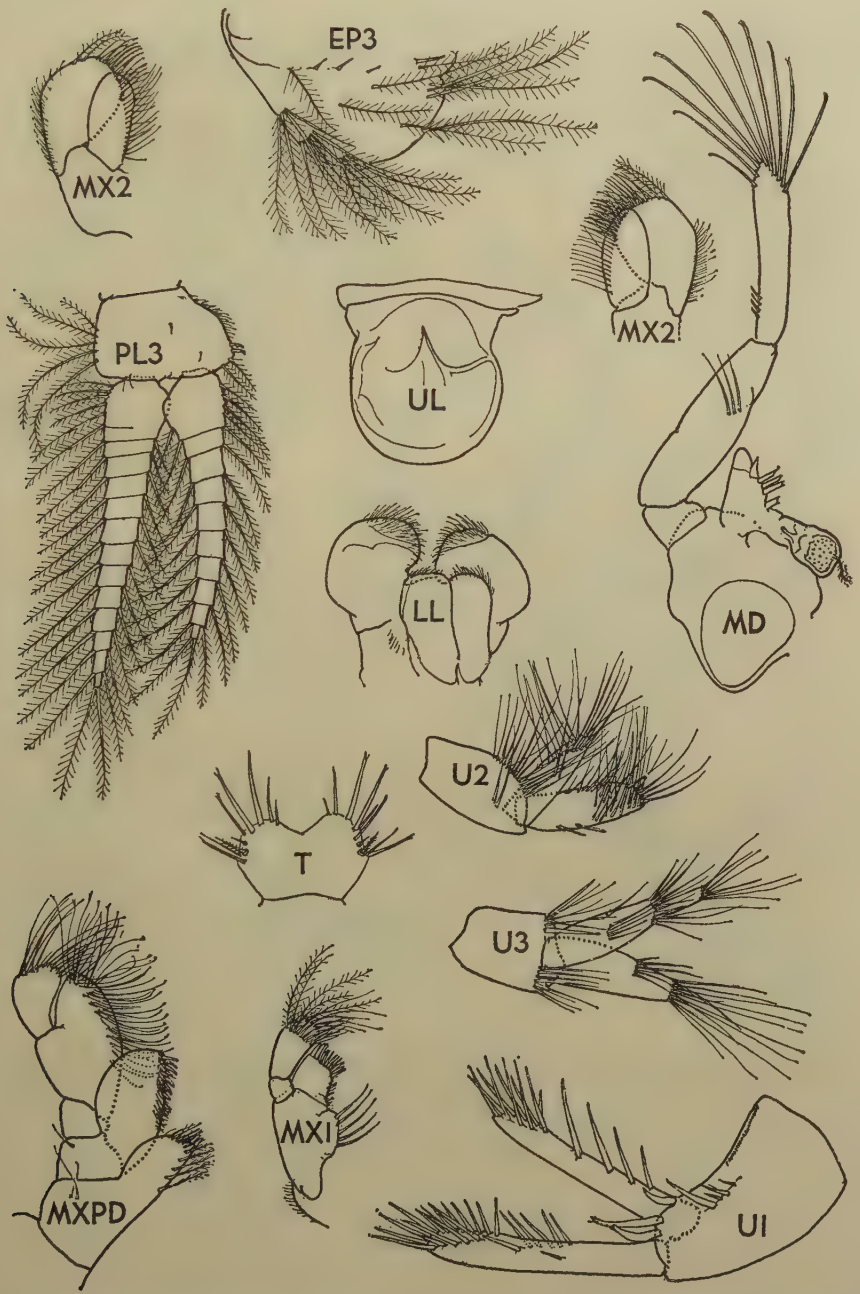

FIGURE 7.—*Protohaustorius deichmannae*, new species, ♀, 6.0 mm., holotype, Barnstable Harbor, Mass.

FIGURE 8.—*Protohaustorius wigleyi*, new species, ♀, 5.5 mm., holotype, off Cape Cod, Mass., *Albatross*-101, sta. 89.

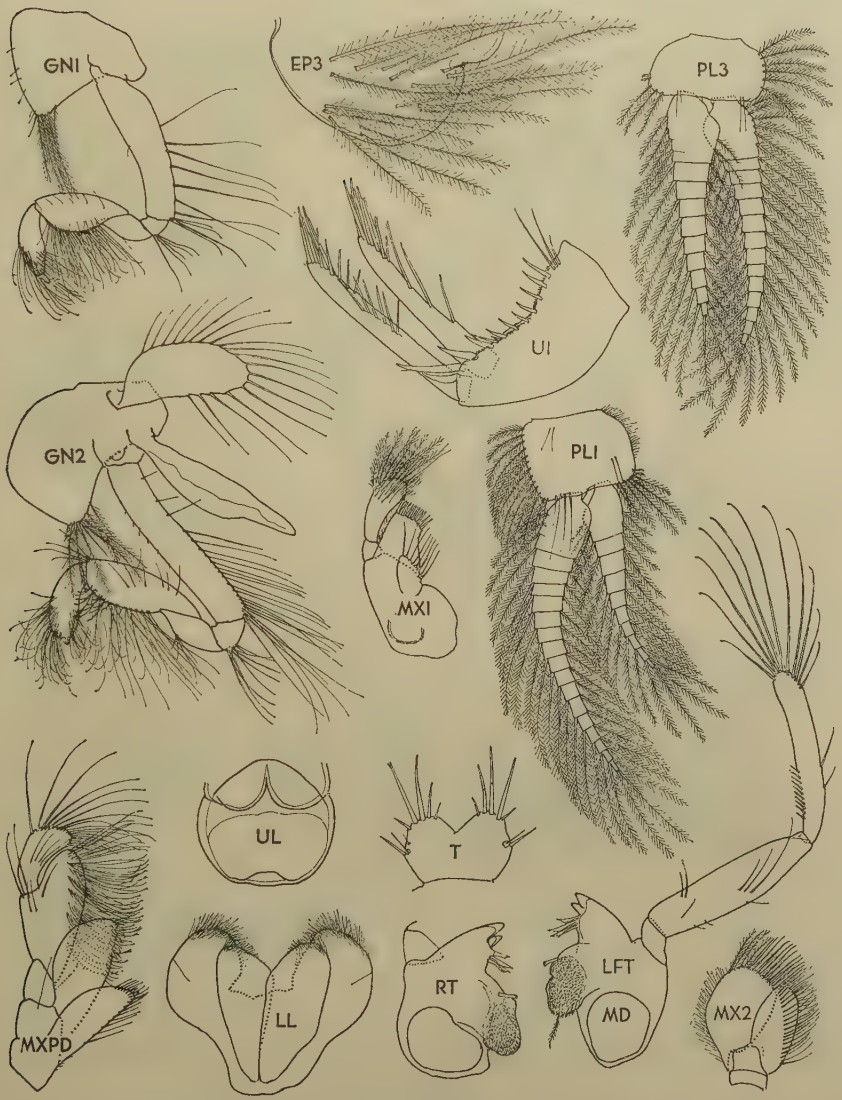

FIGURE 9.—*Protohaustorius wigleyi*, new species, ♀, 5.5 mm., holotype, off Cape Cod, Mass., *Albatross*-101, sta. 89.

FIGURE 10.—*Parahaustorius longimerus*, new species, ♂, 9.5 mm., holotype, Barnstable Harbor, Mass.

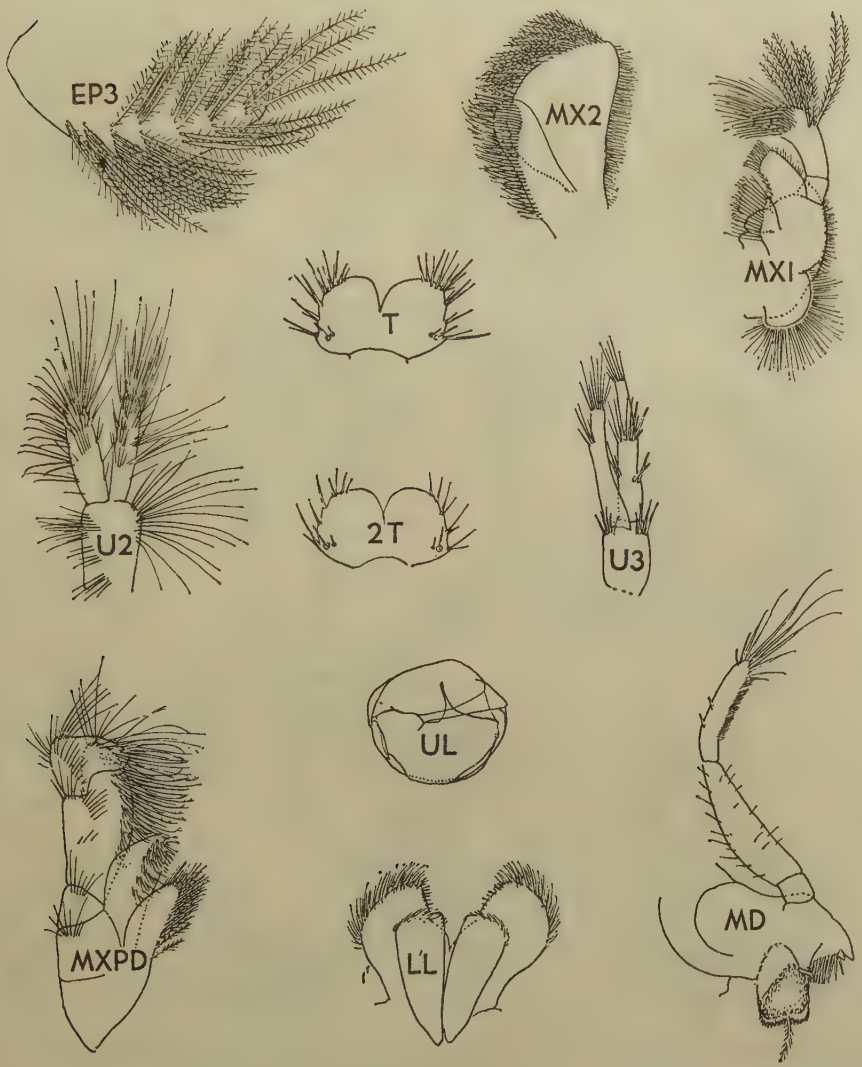

FIGURE 11.—*Parahaustorius longimerus*, new species, ♂, 9.5 mm., holotype, Barnstable Harbor, Mass.

FIGURE 12.—*Parahaustorius holmesi*, new species, ♂, 10 mm., holotype, off New England Creek, N.J.

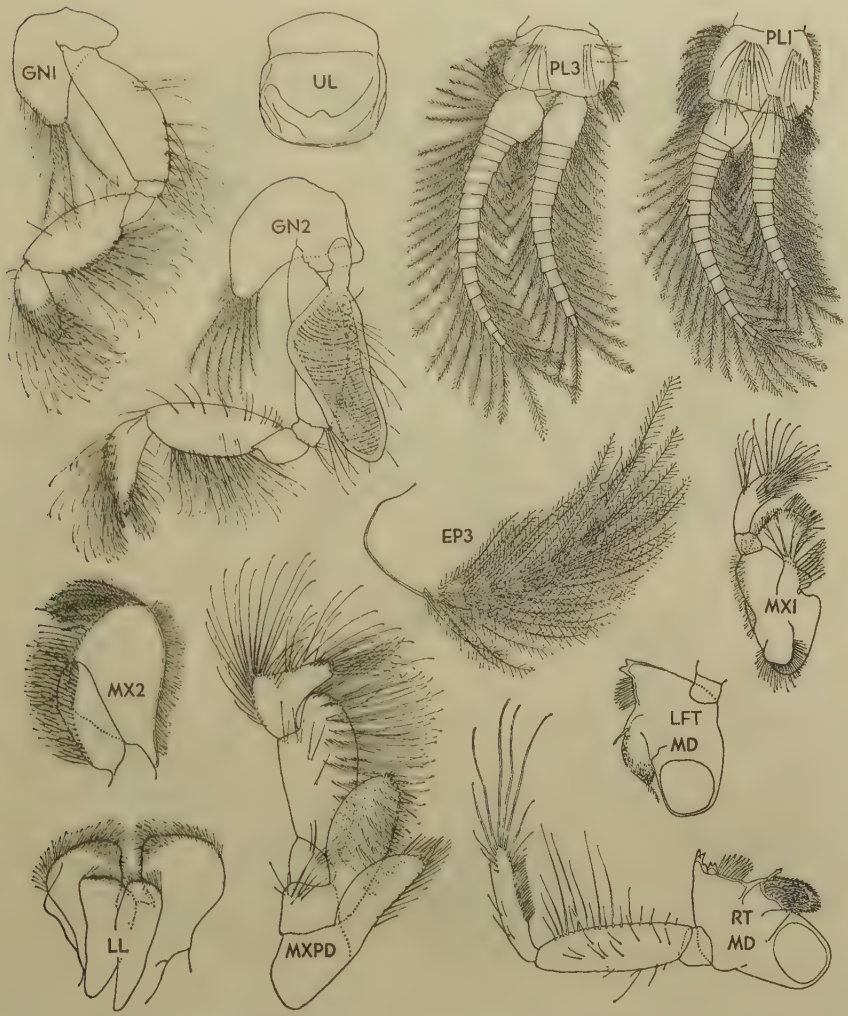

FIGURE 13.—*Parahaustorius holmesi*, new species, ♂, 10 mm., holotype, off New England Creek, N.J.

FIGURE 14.—*Parahaustorius attenuatus*, new species, ♂, 12.5 mm., holotype, sta. 156 New Jersey.

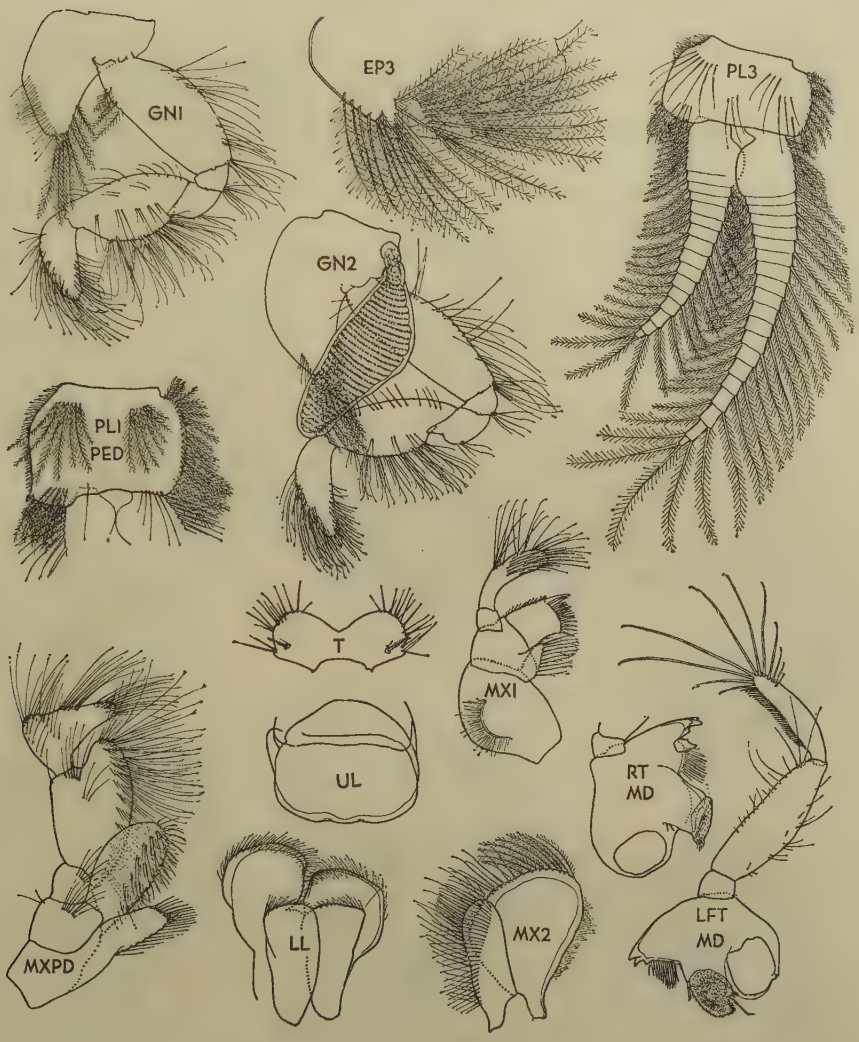

FIGURE 15.—*Parahaustorius attenuatus*, new species, ♂, 12.5 mm., holotype, sta. 156, New Jersey.

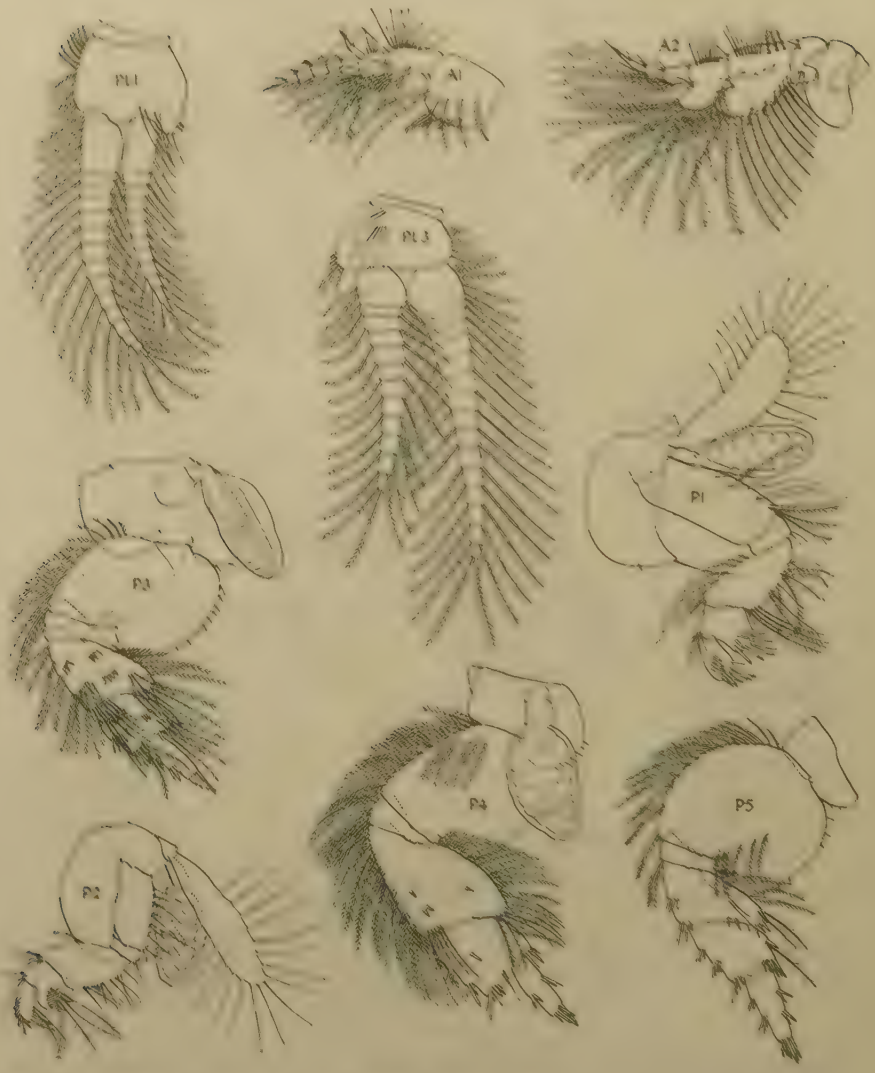

FIGURE 16.—*Neohaustorius biarticulatus*, new species, ♀, 5.0 mm., holotype, Sippewisset Marsh, Mass.

FIGURE 17.—*Neohaustorius biarticulatus*, new species, ♀, 5.0 mm., holotype, Sippewissett Marsh, Mass.

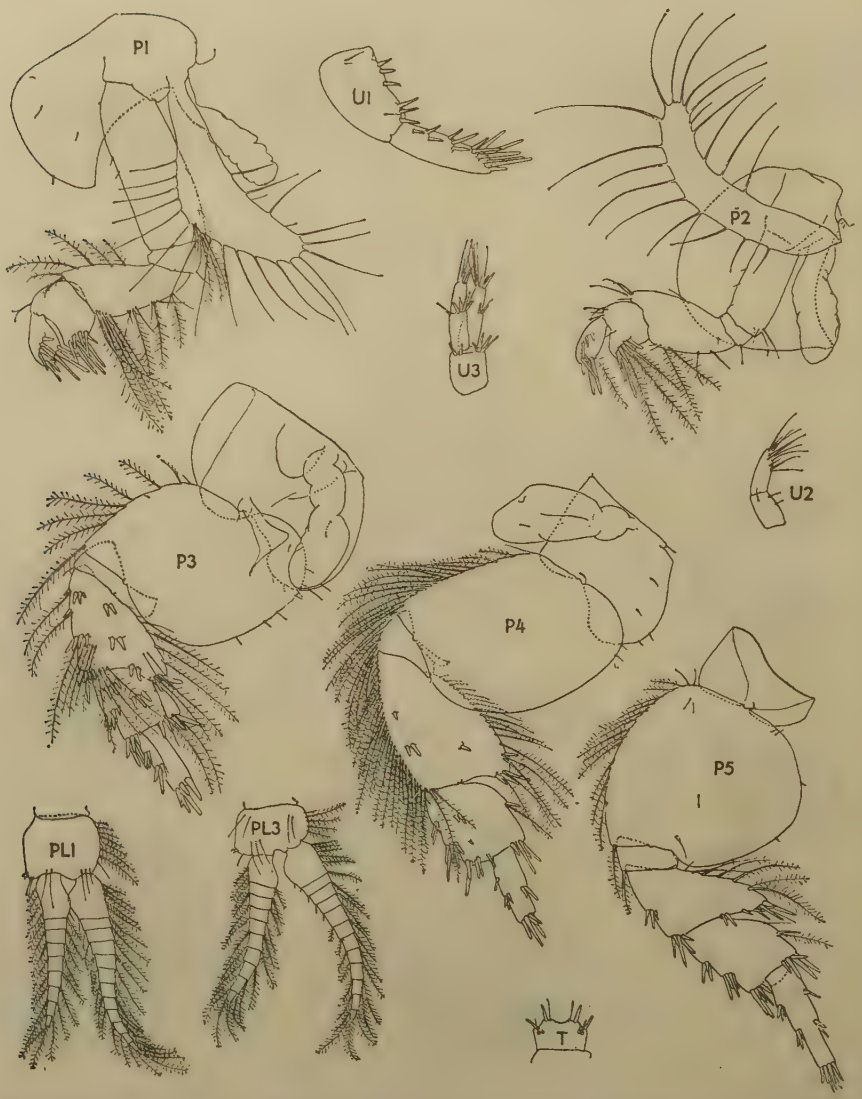

FIGURE 18.—*Neohaustorius schmitzi*, new species, ♀, 4.5 mm., holotype, Morehead City, N.C.

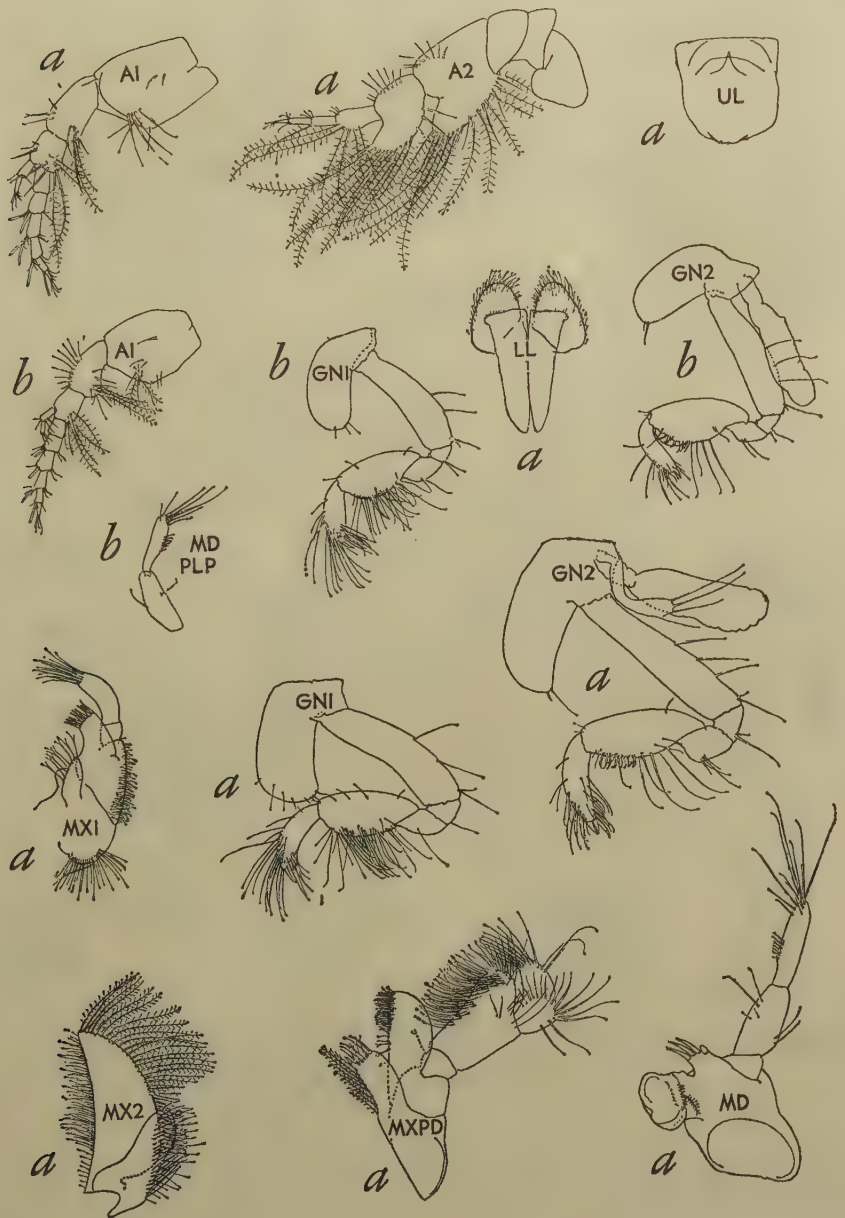

FIGURE 19.—*Neohaustorius schmitzi*, new species, ♀, 4.5 mm., holotype, Morehead City, N.C.; *a*, ♀, 4.5 mm., holotype; *b*, ♂, 3.5 mm., allotype.

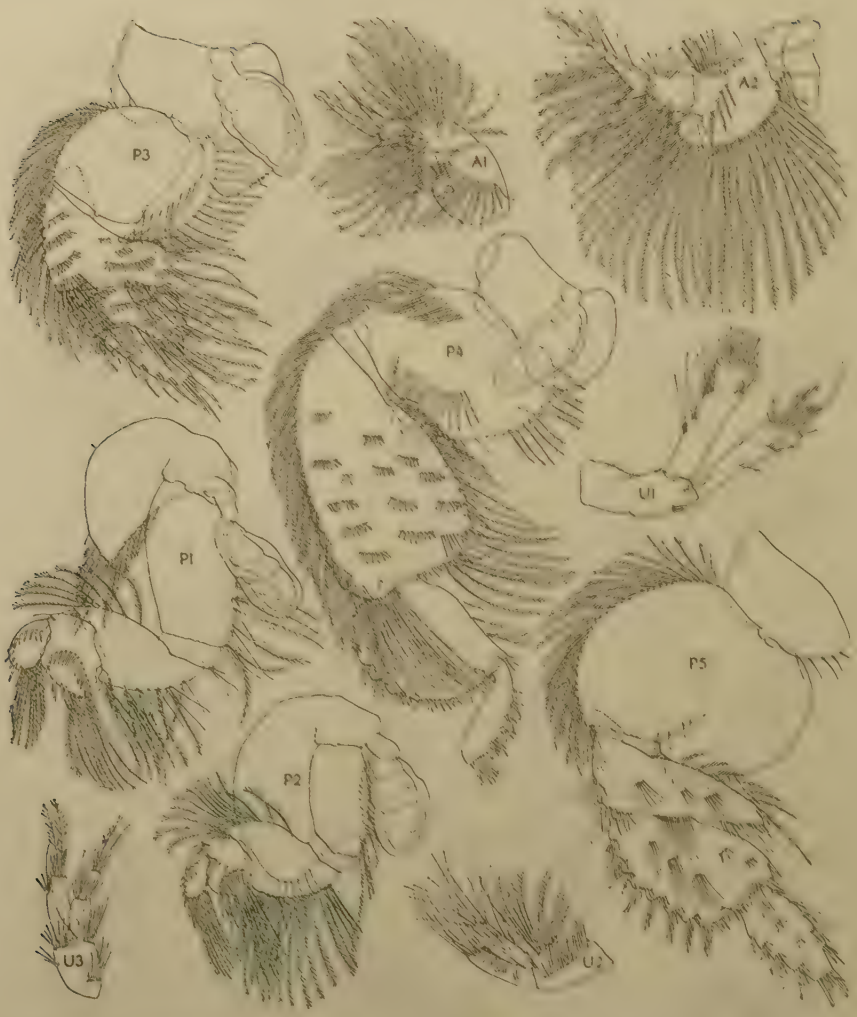

FIGURE 20.—*Pseudohaustorius borealis*, new species, ♂, 6.5 mm., holotype, off Cape Cod, Mass., *Albatross*-101, sta. 86.

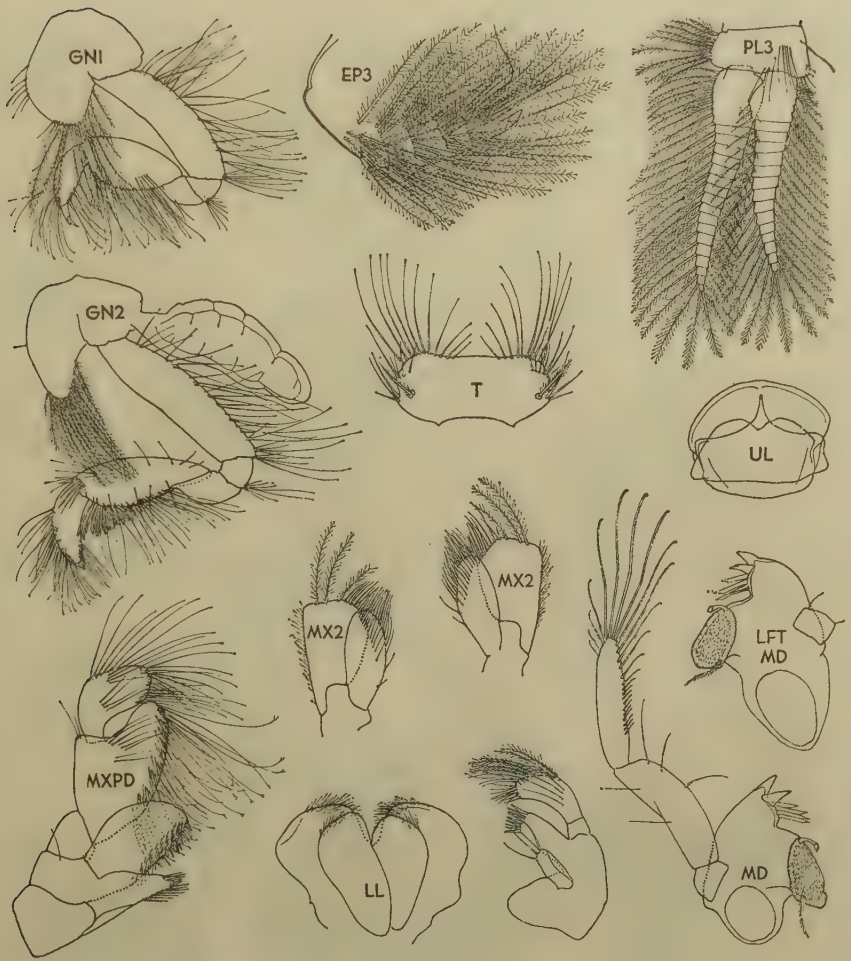

FIGURE 21.—*Pseudohaustorius borealis*, new species, ♂, 6.5 mm., holotype, off Cape Cod, Mass., *Albatross*-101, sta. 86.

FIGURE 22.—*Acanthohaustorius millsi*, new species, ♀, 8.0 mm., holotype, Woods Hole, Mass.

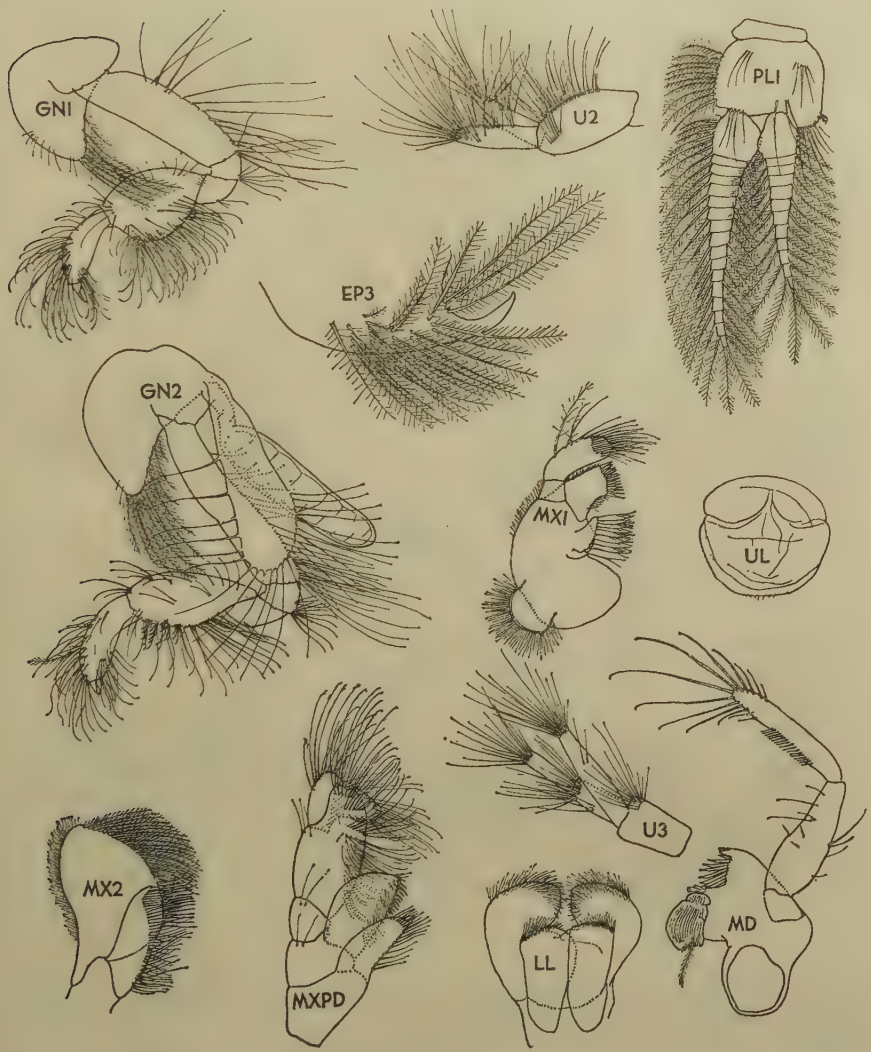

FIGURE 23.—*Acanthohaustorius millsi*, new species, ♀, 8.0 mm., holotype, Woods Hole, Mass.

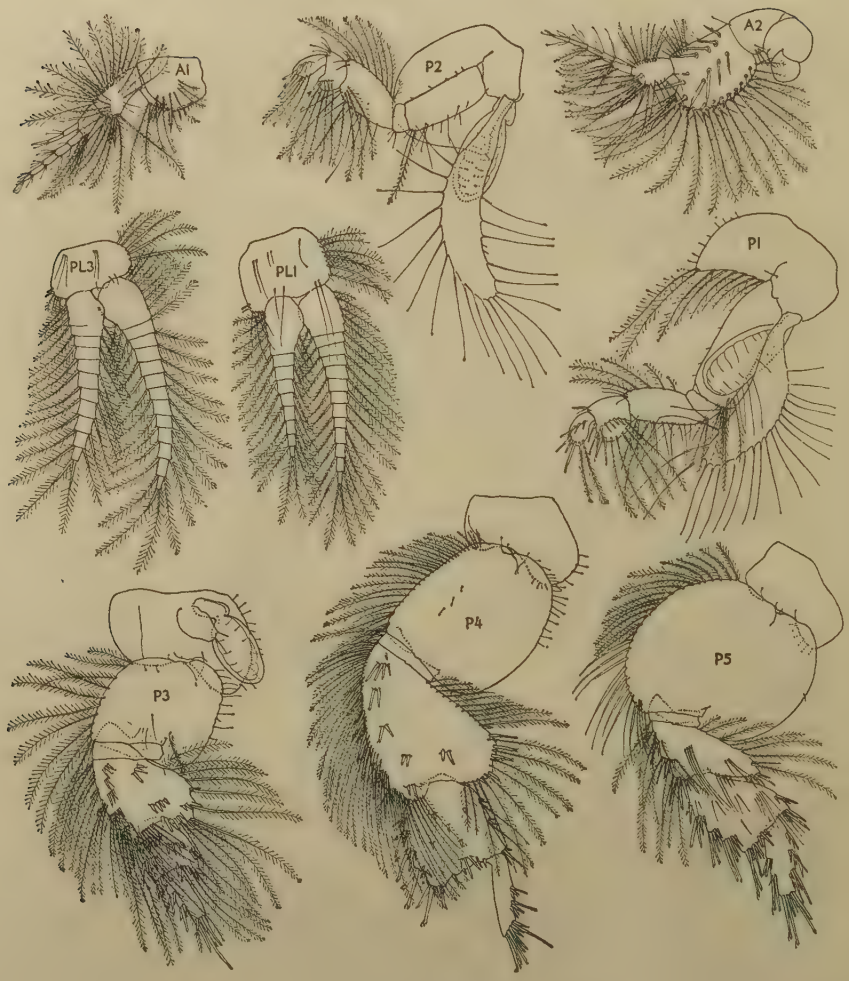

FIGURE 24.—*Acanthohaustorius intermedius*, new species, ♀, 4.5 mm., holotype, Barnstable Harbor, Mass.

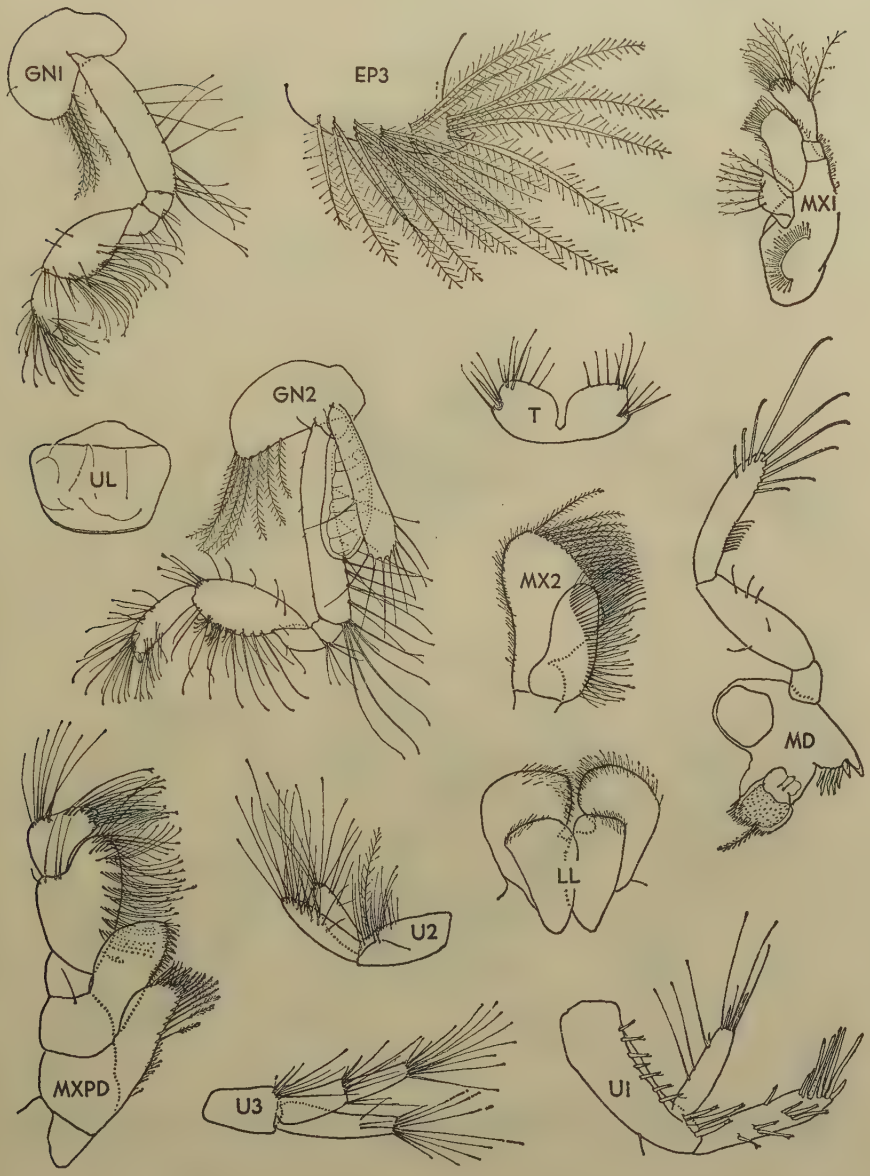

FIGURE 25.—*Acanthohaustorius intermedius*, new species, ♀, 4.5 mm., holotype, Barnstable Harbor, Mass.

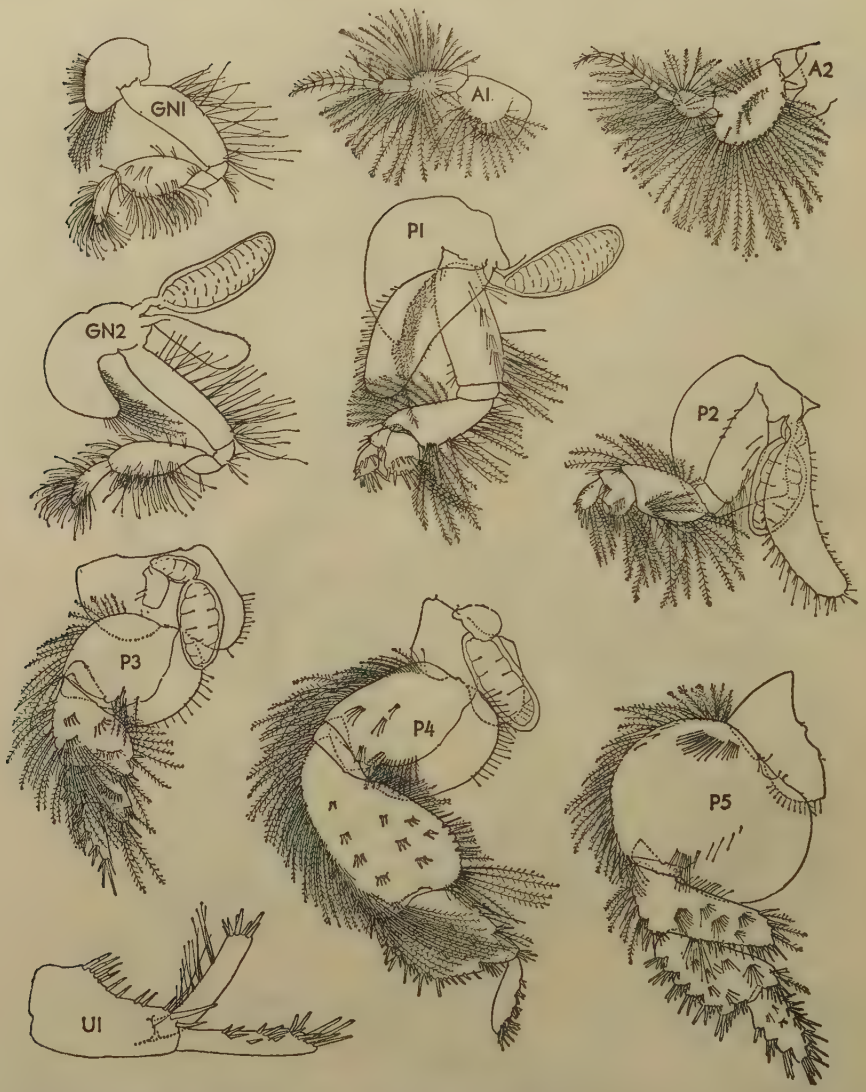

FIGURE 26.—*Acanthohaustorius spinosus* (Bousfield) 1962, ♀, 11.5 mm., holotype, Sandy Cove, N.B.

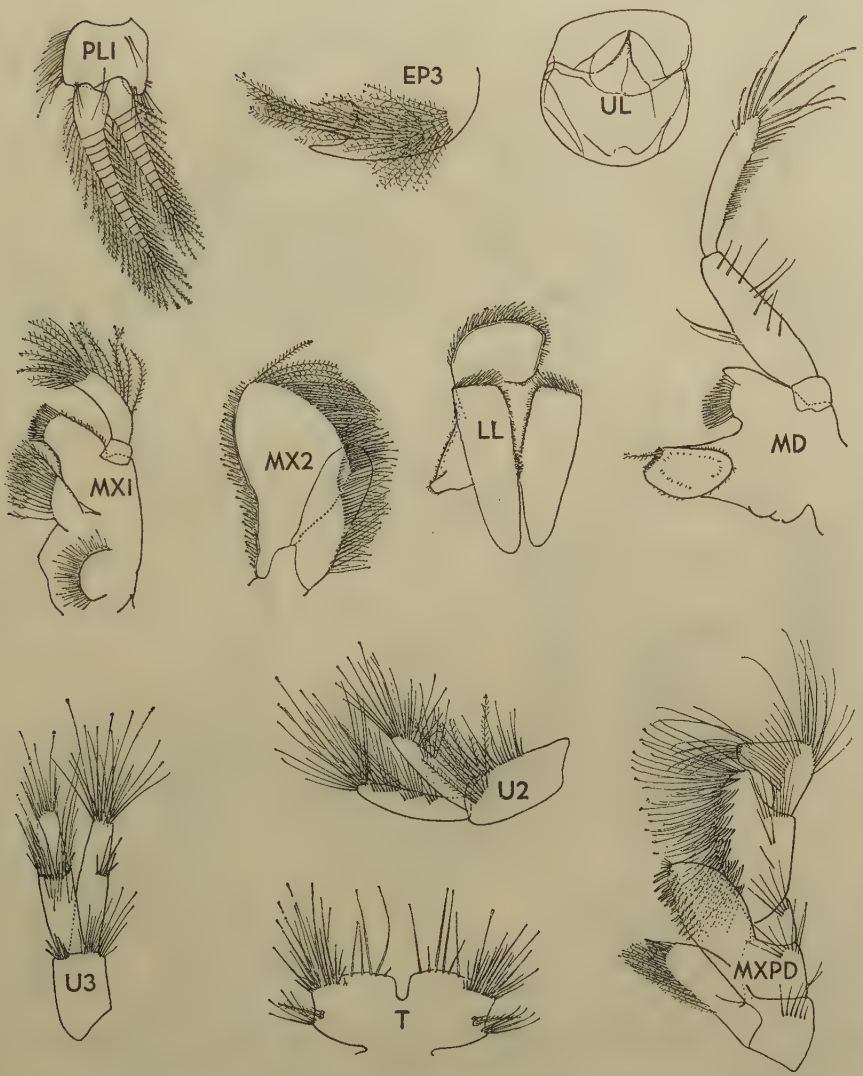

FIGURE 27.—*Acanthohaustorius spinosus* (Bousfield) 1962, ♀, 11.5 mm., holotype, Sandy Cove, N.B.

FIGURE 28.—*Acanthohaustorius shoemakeri*, new species, ♀, 8.5 mm., holotype, off Martha's Vineyard, Mass.

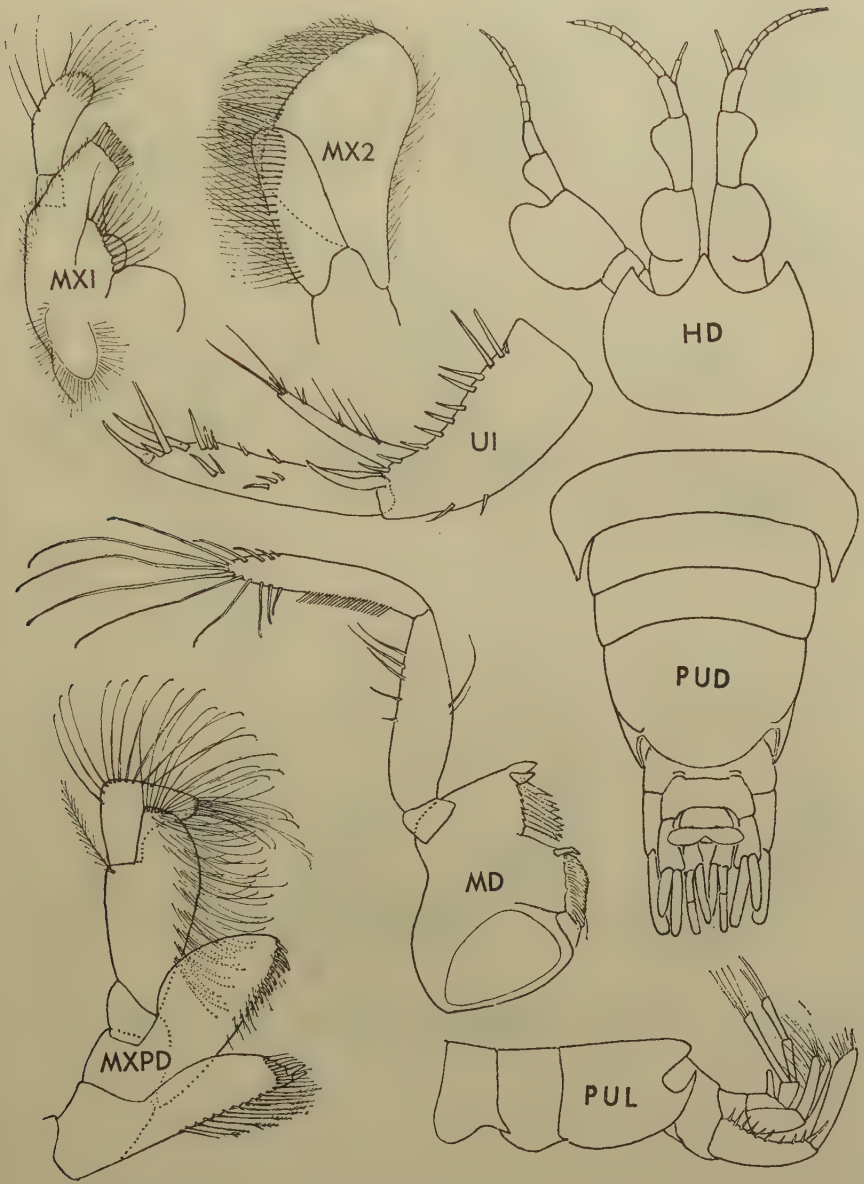

FIGURE 29.—*Acanthohaustorius shoemakeri*, new species, ♀, 8.5 mm., holotype, off Martha's Vineyard, Mass.

FIGURE 30.—*Pseudohaustorius caroliniensis*, new species, ♀, 8.0 mm., holotype, North Falmouth, Mass.

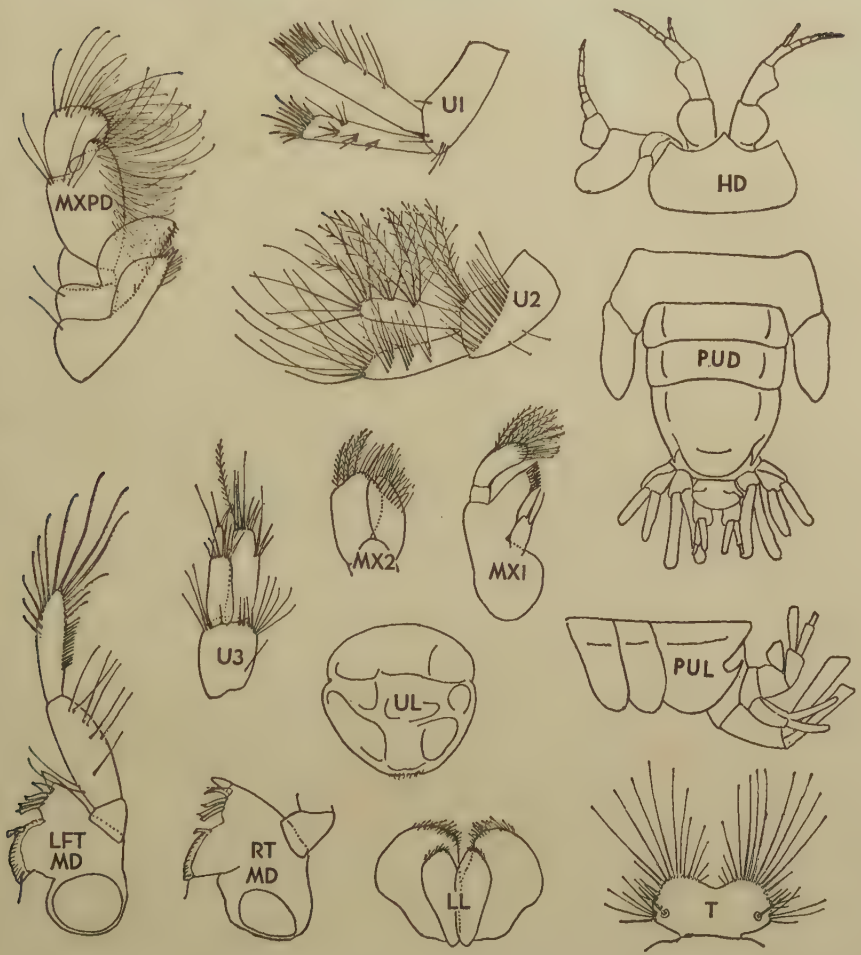

FIGURE 31.—*Pseudohaustorius caroliniensis*, new species, ♀, 8.0 mm., holotype, North Falmouth, Mass.

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